FIG. 1

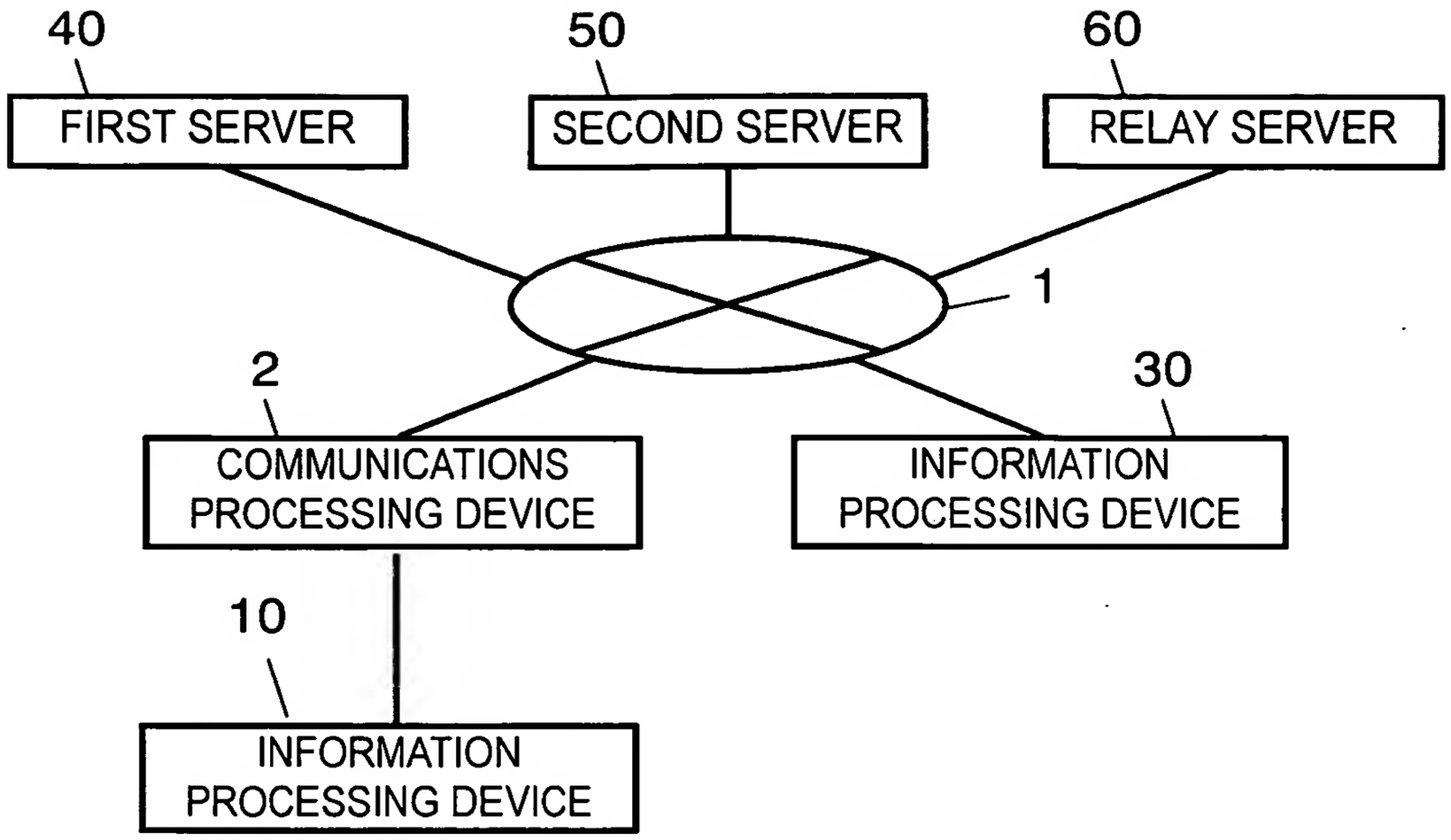

40
FIRST SERVER
50
SECOND SERVER
60
RELAY SERVER
1
2
COMMUNICATIONS PROCESSING DEVICE
30
INFORMATION PROCESSING DEVICE
10
INFORMATION PROCESSING DEVICE

FIG. 2

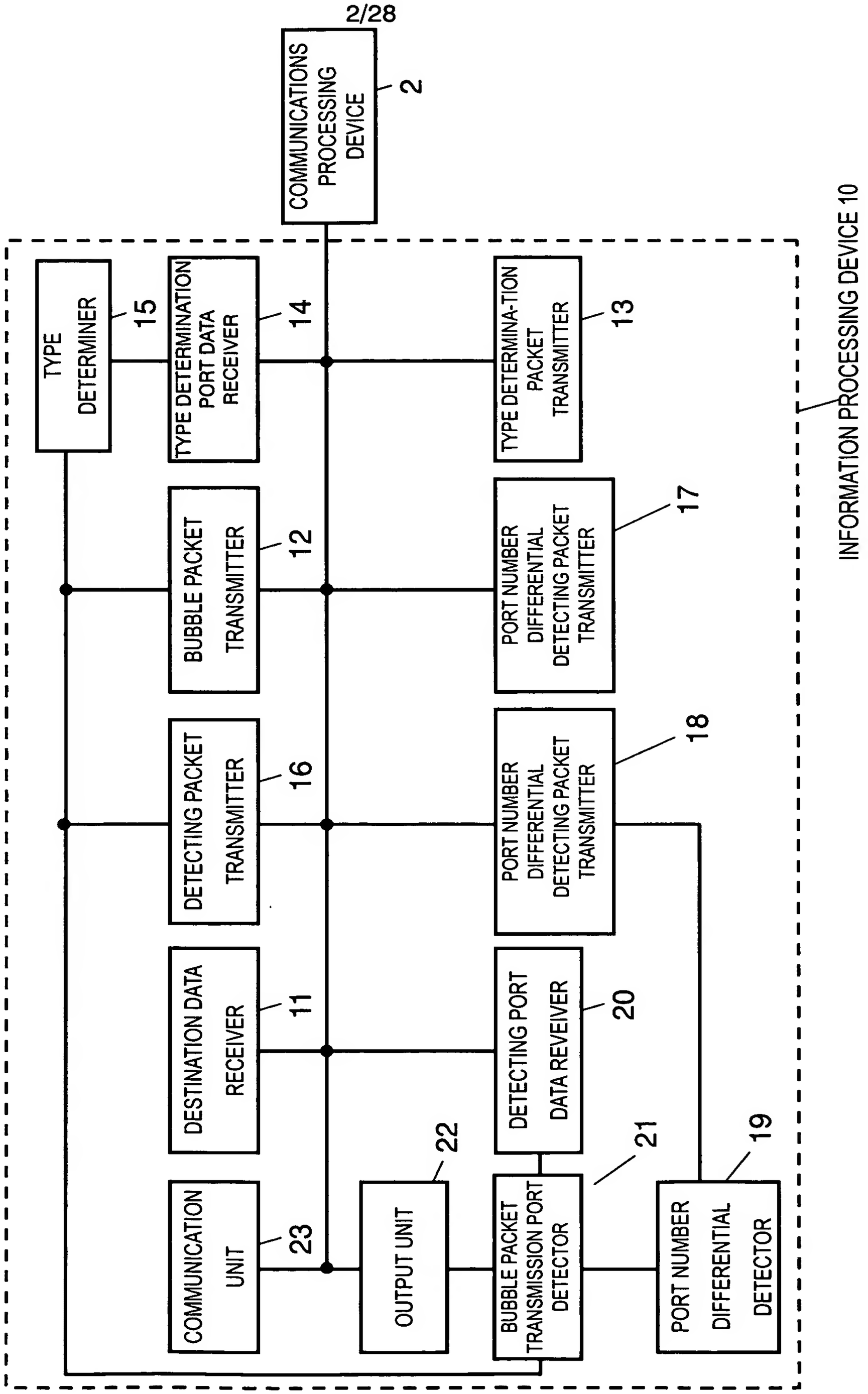

COMMUNICATIONS PROCESSING DEVICE
2
INFORMATION PROCESSING DEVICE 10
TYPE DETERMINER
15
TYPE DETERMINATION PORT DATA RECEIVER
14
TYPE DETERMINA-TION PACKET TRANSMITTER
13
BUBBLE PACKET TRANSMITTER
12
PORT NUMBER DIFFERENTIAL DETECTING PACKET TRANSMITTER
17
DETECTING PACKET TRANSMITTER
16
PORT NUMBER DIFFERENTIAL DETECTING PACKET TRANSMITTER
18
DESTINATION DATA RECEIVER
11
DETECTING PORT DATA REVEIVER
20
COMMUNICATION UNIT
23
OUTPUT UNIT
22
BUBBLE PACKET TRANSMISSION PORT DETECTOR
21
PORT NUMBER DIFFERENTIAL DETECTOR
19

FIG. 3

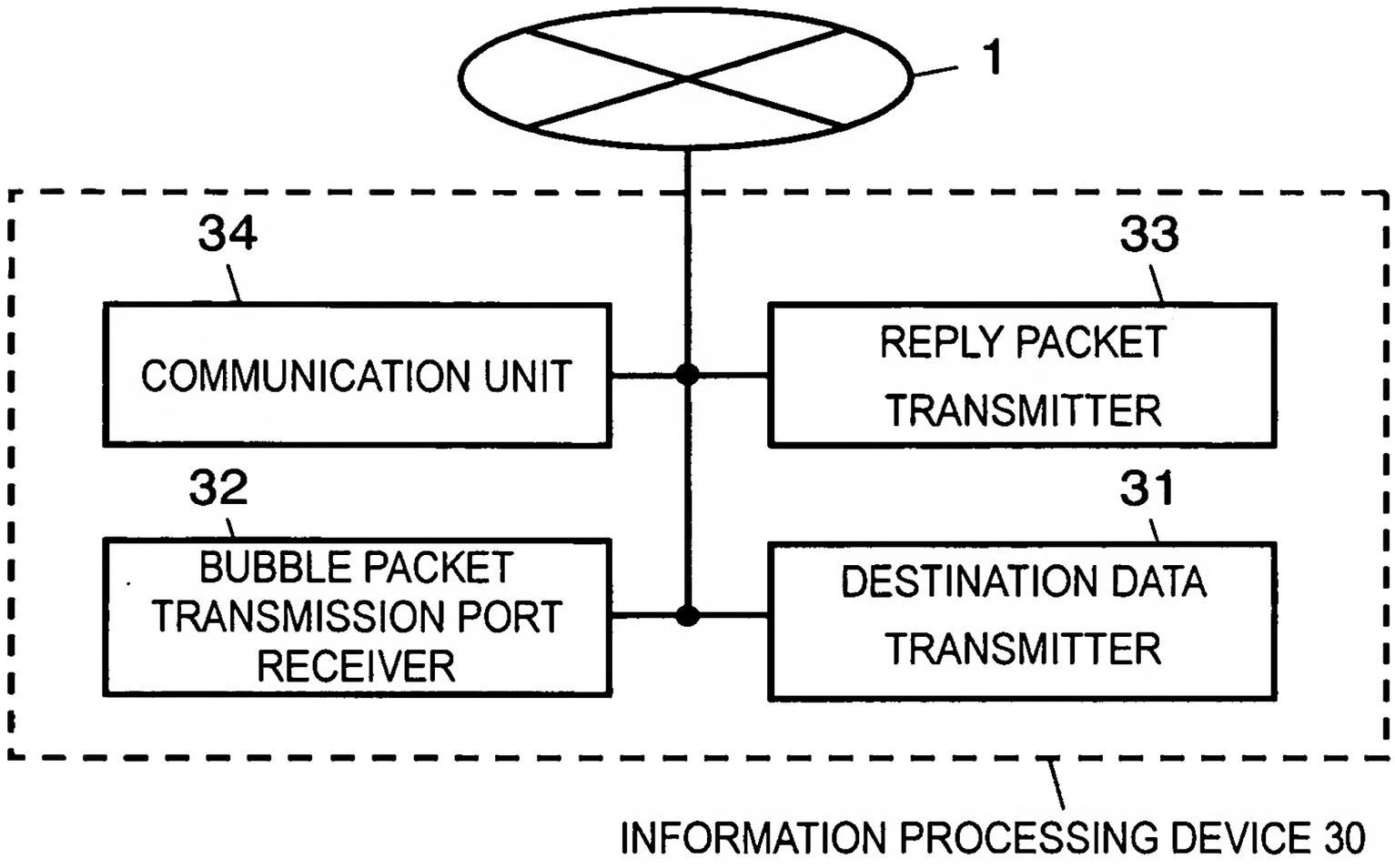

1
34
COMMUNICATION UNIT
33
REPLY PACKET TRANSMITTER
32
BUBBLE PACKET TRANSMISSION PORT RECEIVER
31
DESTINATION DATA TRANSMITTER
INFORMATION PROCESSING DEVICE 30

FIG. 4

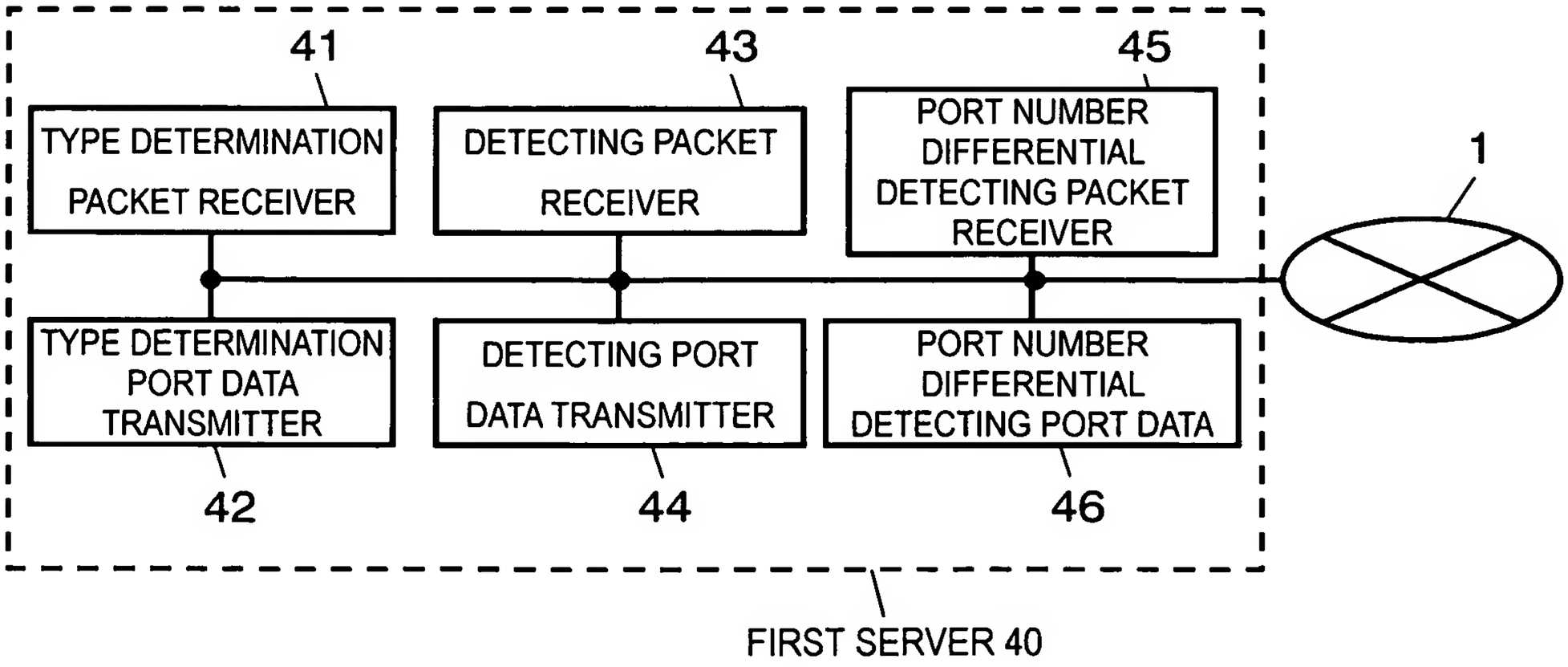

41
TYPE DETERMINATION PACKET RECEIVER
43
DETECTING PACKET RECEIVER
45
PORT NUMBER DIFFERENTIAL DETECTING PACKET RECEIVER
1
TYPE DETERMINATION PORT DATA TRANSMITTER
42
DETECTING PORT DATA TRANSMITTER
44
PORT NUMBER DIFFERENTIAL DETECTING PORT DATA
46
FIRST SERVER 40

FIG. 5

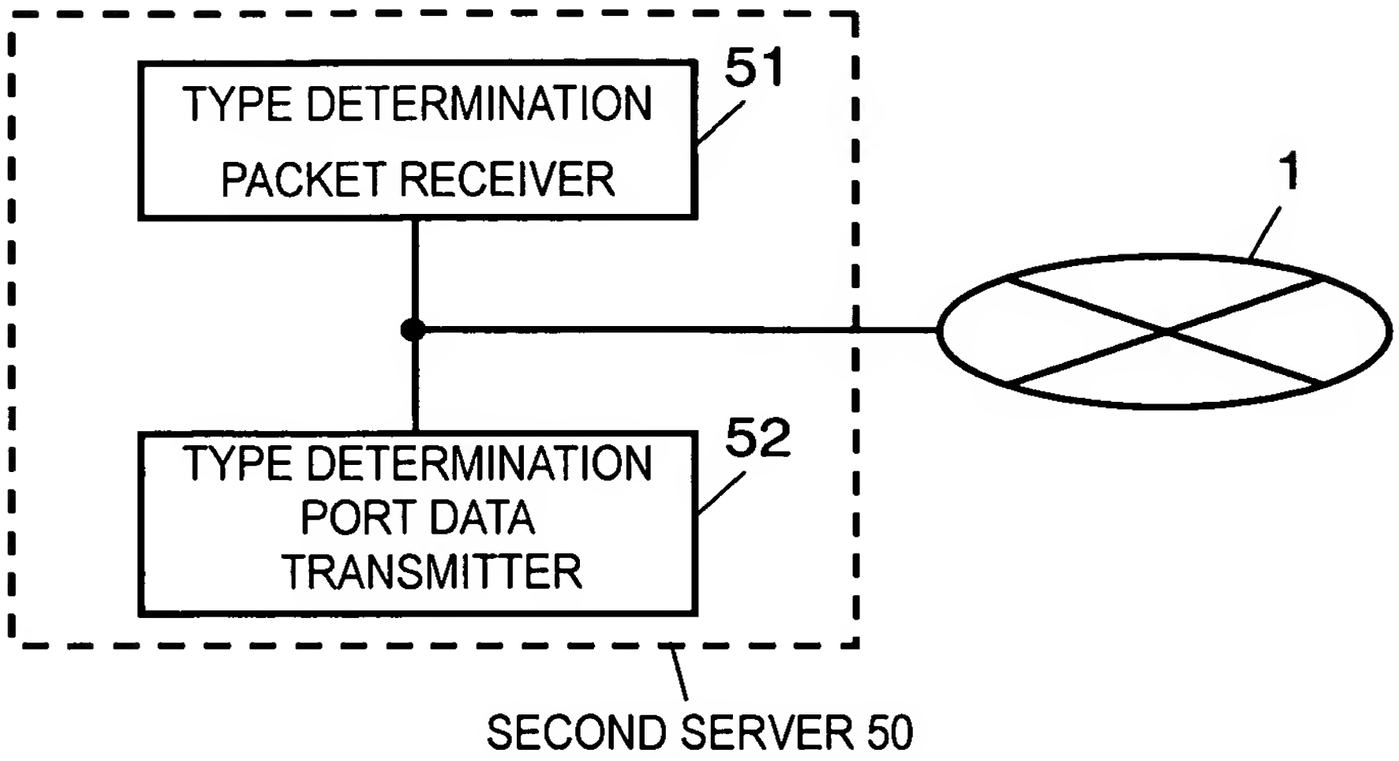

TYPE DETERMINATION PACKET RECEIVER
51
1
TYPE DETERMINATION PORT DATA TRANSMITTER
52
SECOND SERVER 50

FIG. 6

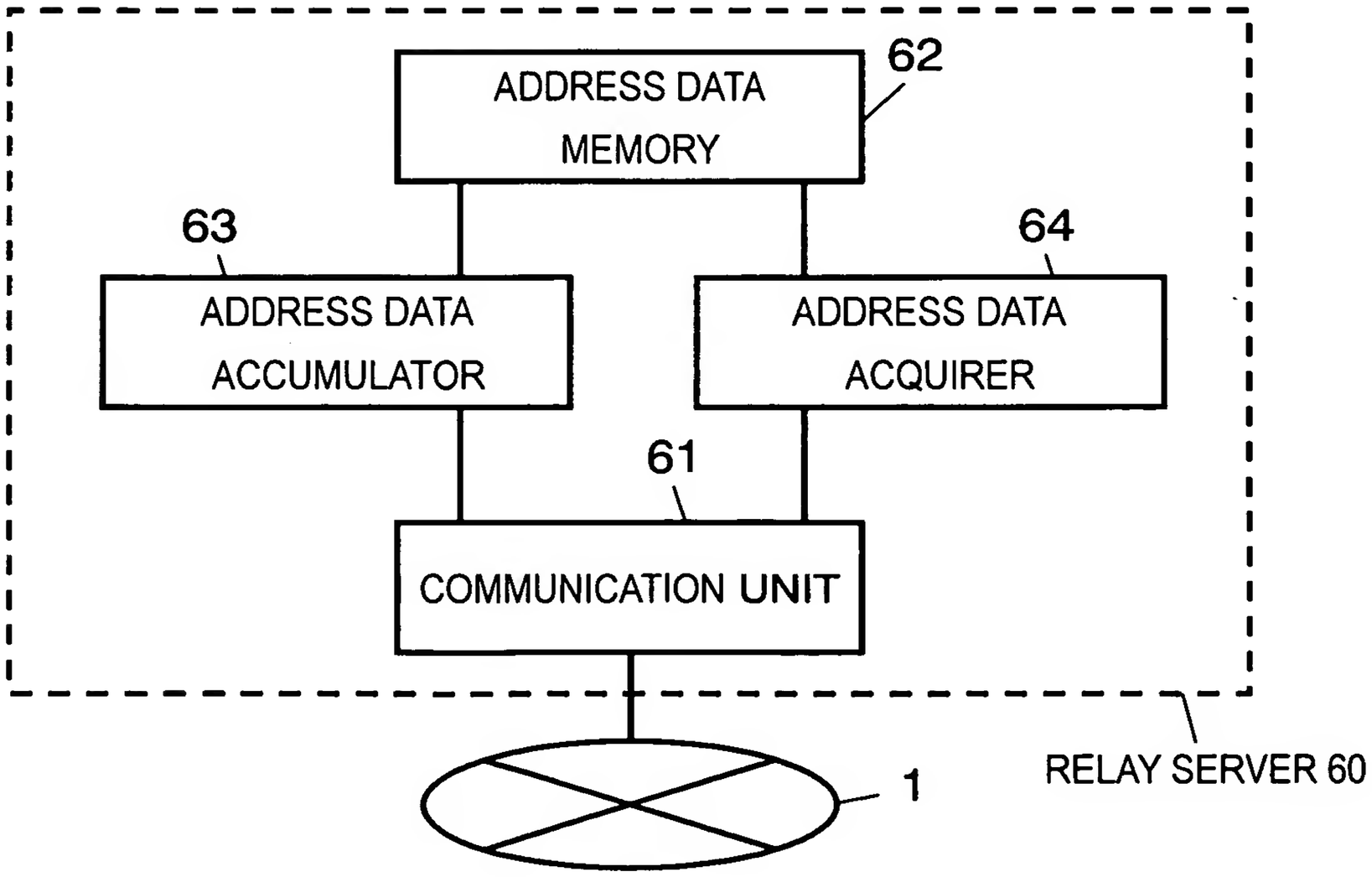

ADDRESS DATA MEMORY
62
63
64
ADDRESS DATA ACCUMULATOR
ADDRESS DATA ACQUIRER
61
COMMUNICATION UNIT
1
RELAY SERVER 60

FIG. 7

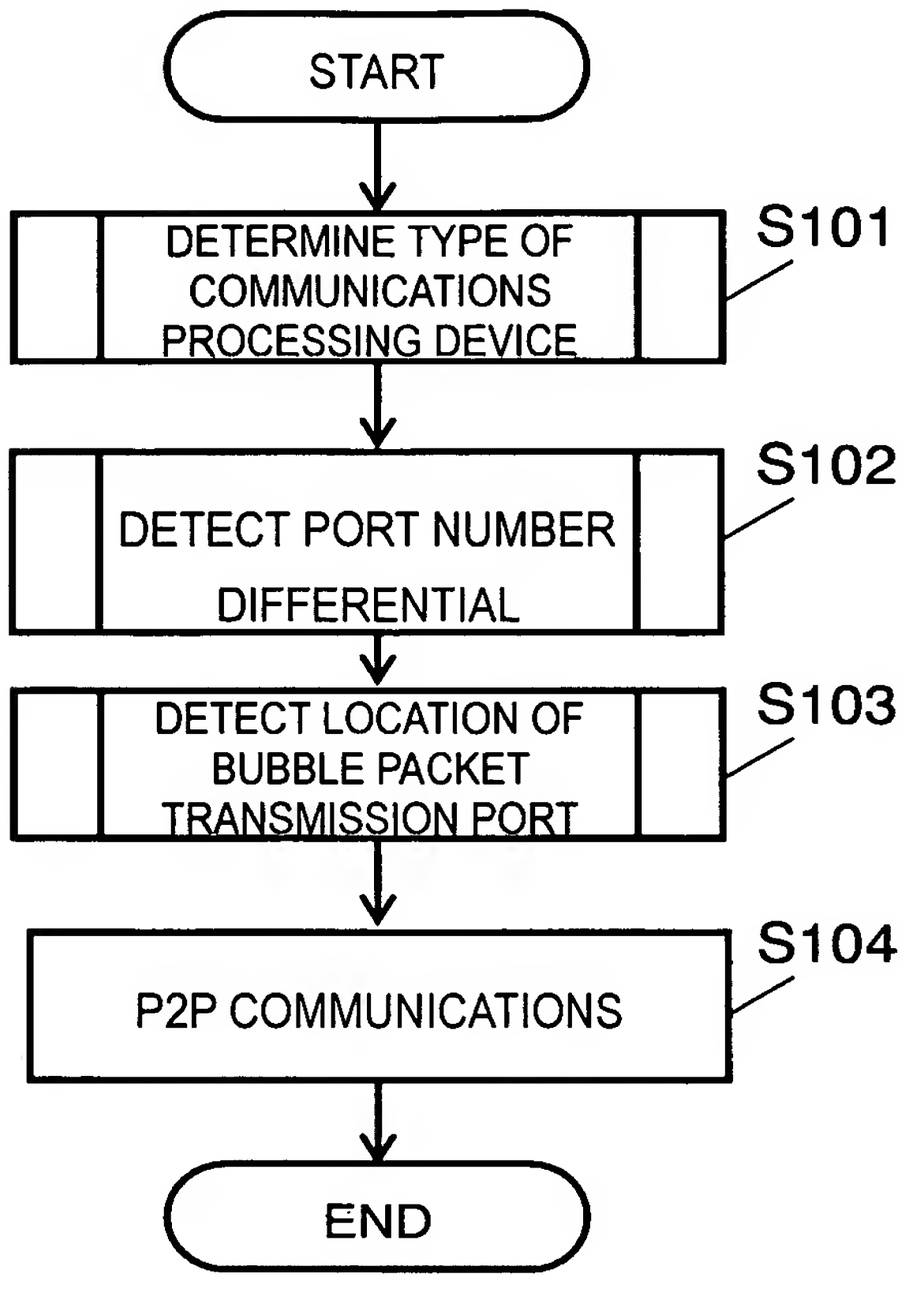

START
DETERMINE TYPE OF COMMUNICATIONS PROCESSING DEVICE
S101
DETECT PORT NUMBER DIFFERENTIAL
S102
DETECT LOCATION OF BUBBLE PACKET TRANSMISSION PORT
S103
P2P COMMUNICATIONS
S104
END

FIG. 8

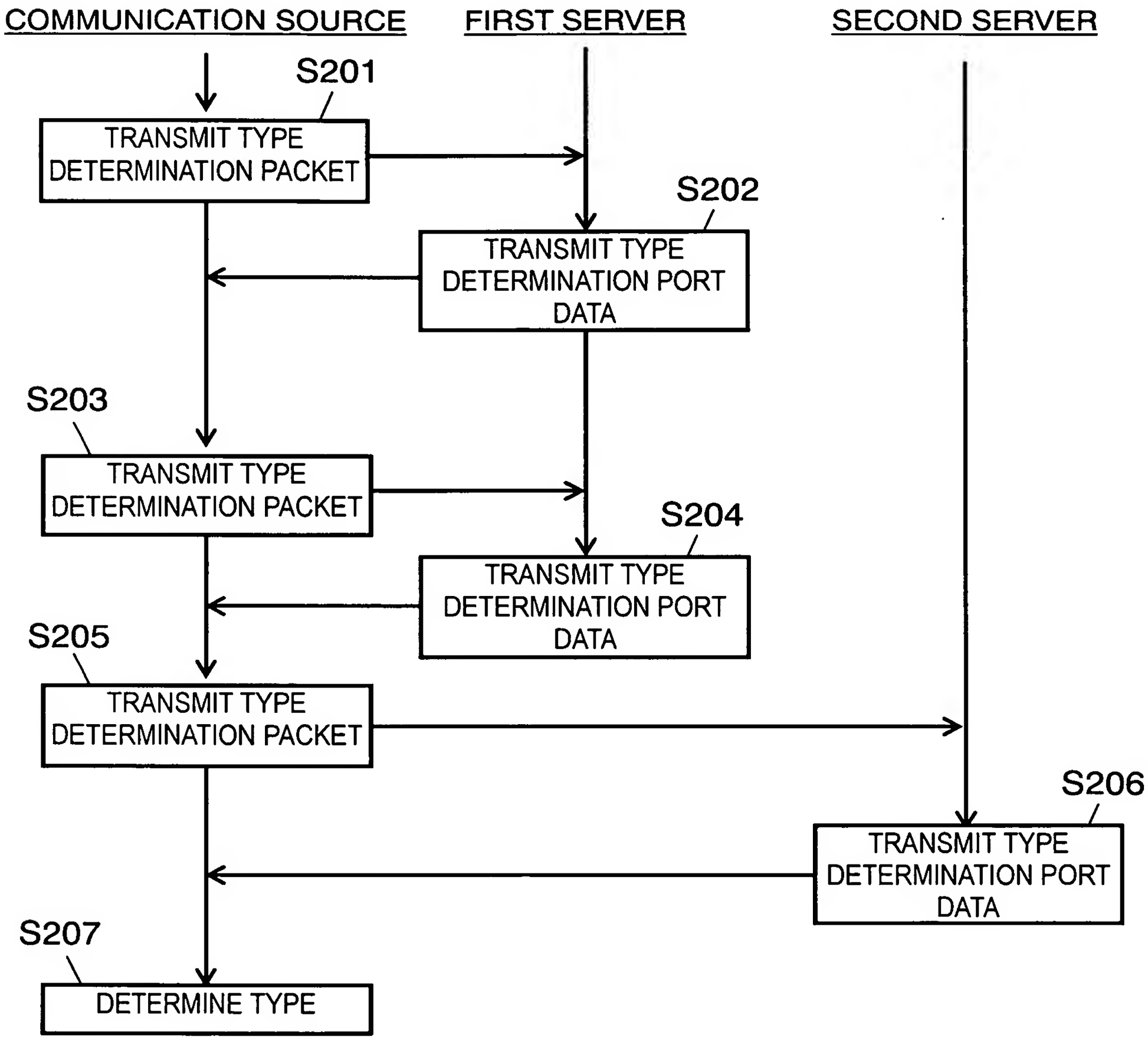

COMMUNICATION SOURCE
FIRST SERVER
SECOND SERVER
S201
TRANSMIT TYPE DETERMINATION PACKET
S202
TRANSMIT TYPE DETERMINATION PORT DATA
S203
TRANSMIT TYPE DETERMINATION PACKET
S204
TRANSMIT TYPE DETERMINATION PORT DATA
S205
TRANSMIT TYPE DETERMINATION PACKET
S206
TRANSMIT TYPE DETERMINATION PORT DATA
S207
DETERMINE TYPE

FIG. 9

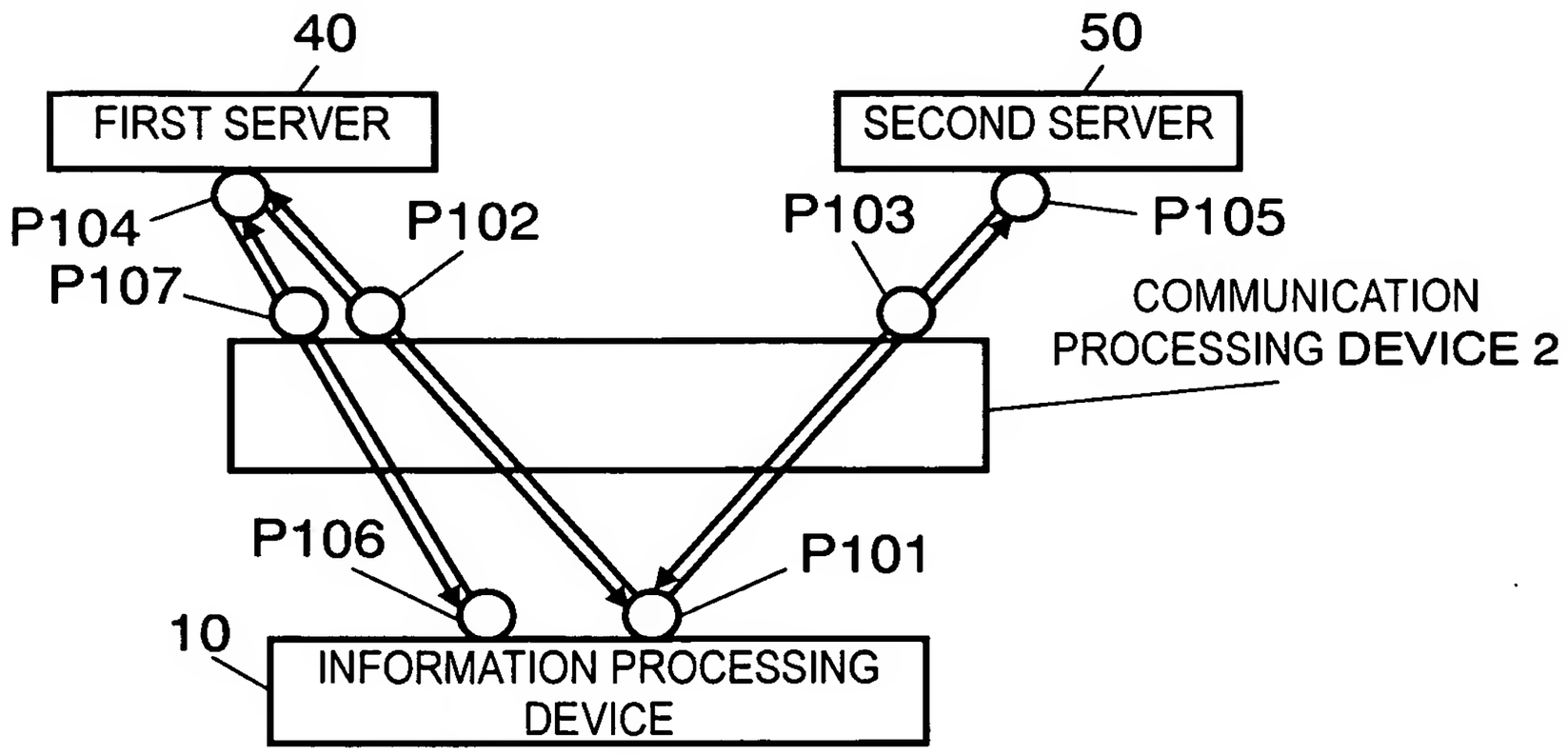

40
FIRST SERVER
50
SECOND SERVER
P104
P102
P103
P105
P107
COMMUNICATION
PROCESSING DEVICE 2
P106
P101
10
INFORMATION PROCESSING
DEVICE

FIG. 10

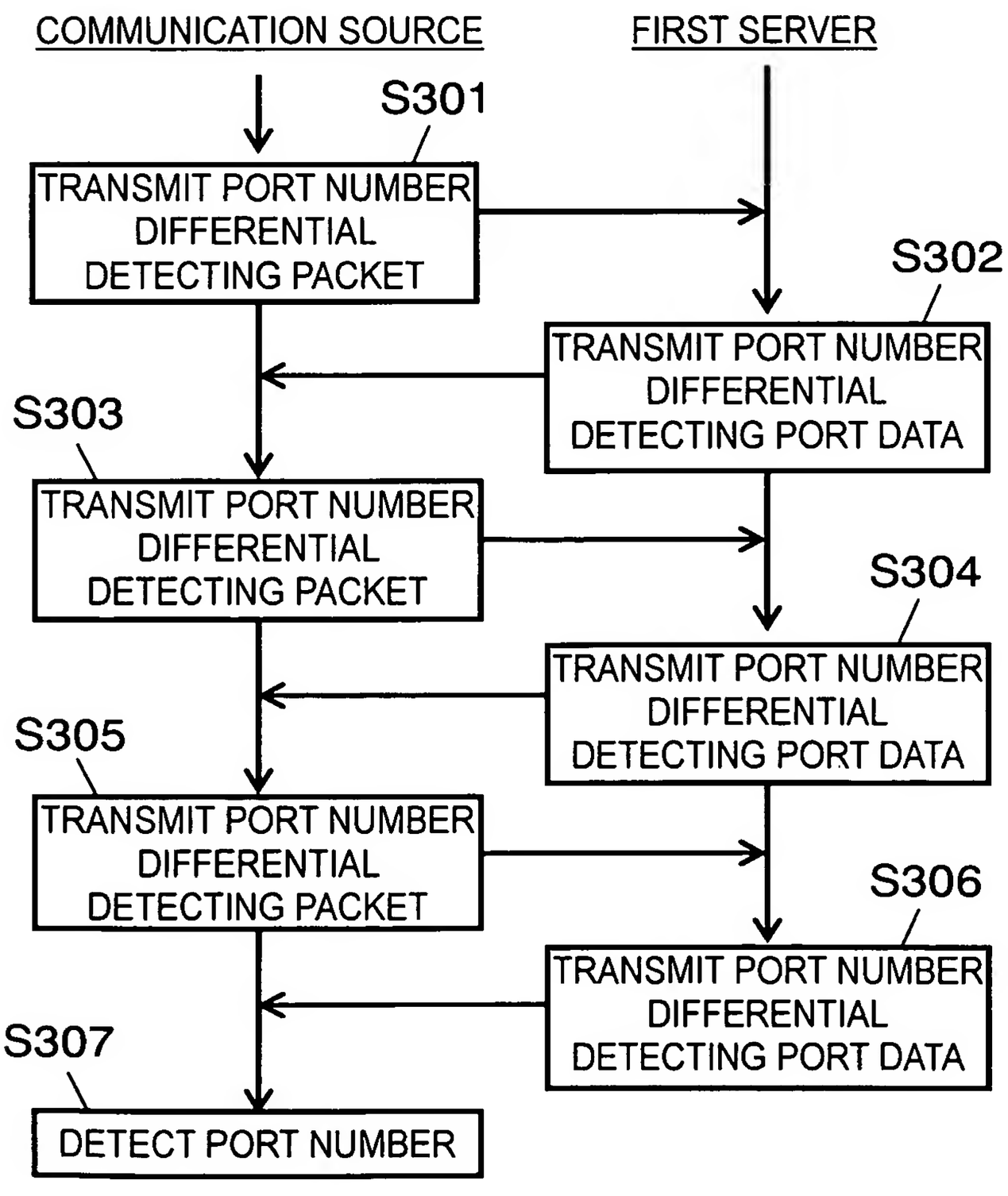

COMMUNICATION SOURCE
FIRST SERVER
S301
TRANSMIT PORT NUMBER
DIFFERENTIAL
DETECTING PACKET
S302
TRANSMIT PORT NUMBER
DIFFERENTIAL
DETECTING PORT DATA
S303
TRANSMIT PORT NUMBER
DIFFERENTIAL
DETECTING PACKET
S304
TRANSMIT PORT NUMBER
DIFFERENTIAL
DETECTING PORT DATA
S305
TRANSMIT PORT NUMBER
DIFFERENTIAL
DETECTING PACKET
S306
TRANSMIT PORT NUMBER
DIFFERENTIAL
DETECTING PORT DATA
S307
DETECT PORT NUMBER

FIG. 11

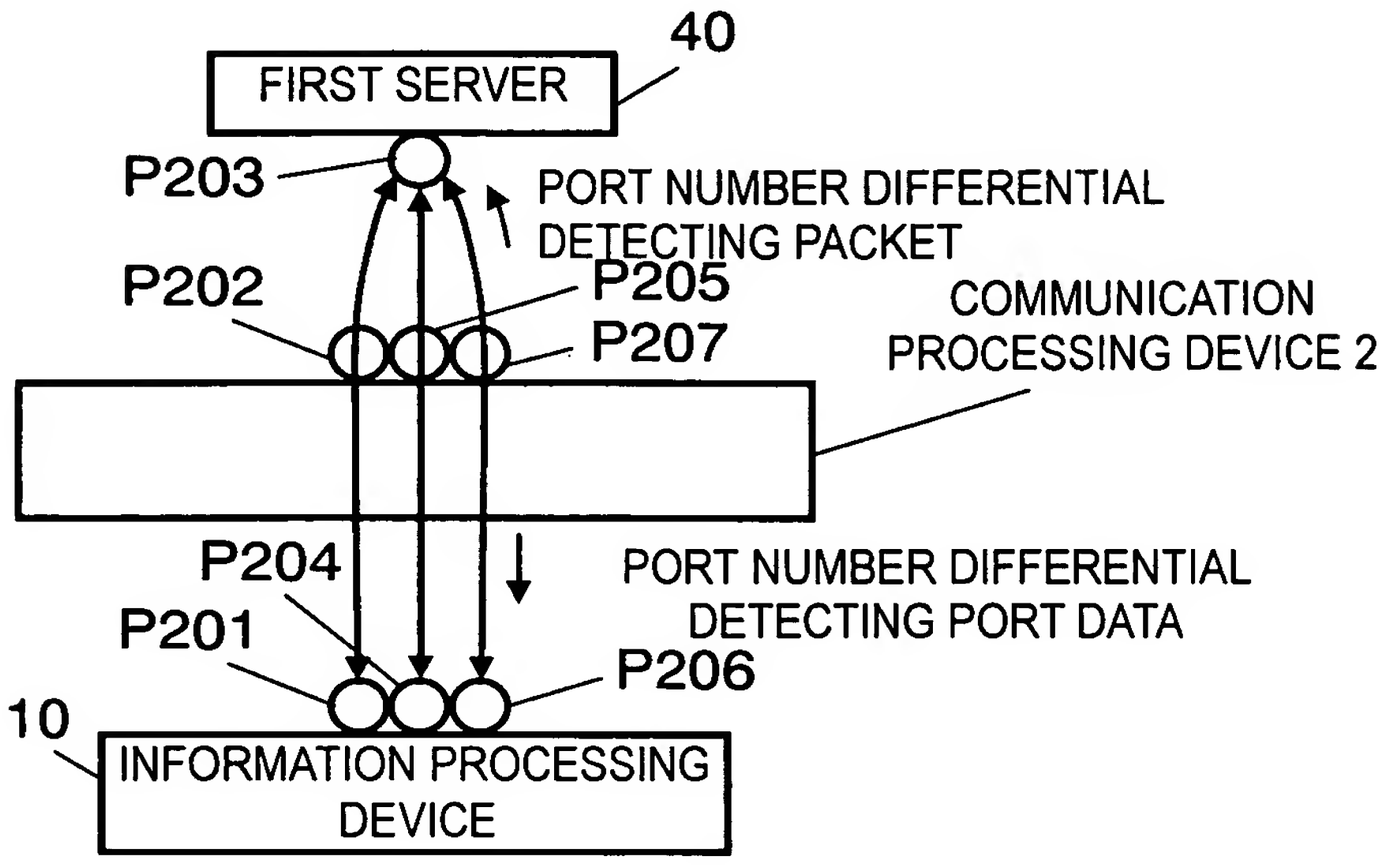

40
FIRST SERVER
P203
PORT NUMBER DIFFERENTIAL
DETECTING PACKET
P202
P205
P207
COMMUNICATION
PROCESSING DEVICE 2
P204
PORT NUMBER DIFFERENTIAL
DETECTING PORT DATA
P201
P206
10
INFORMATION PROCESSING
DEVICE

FIG. 12

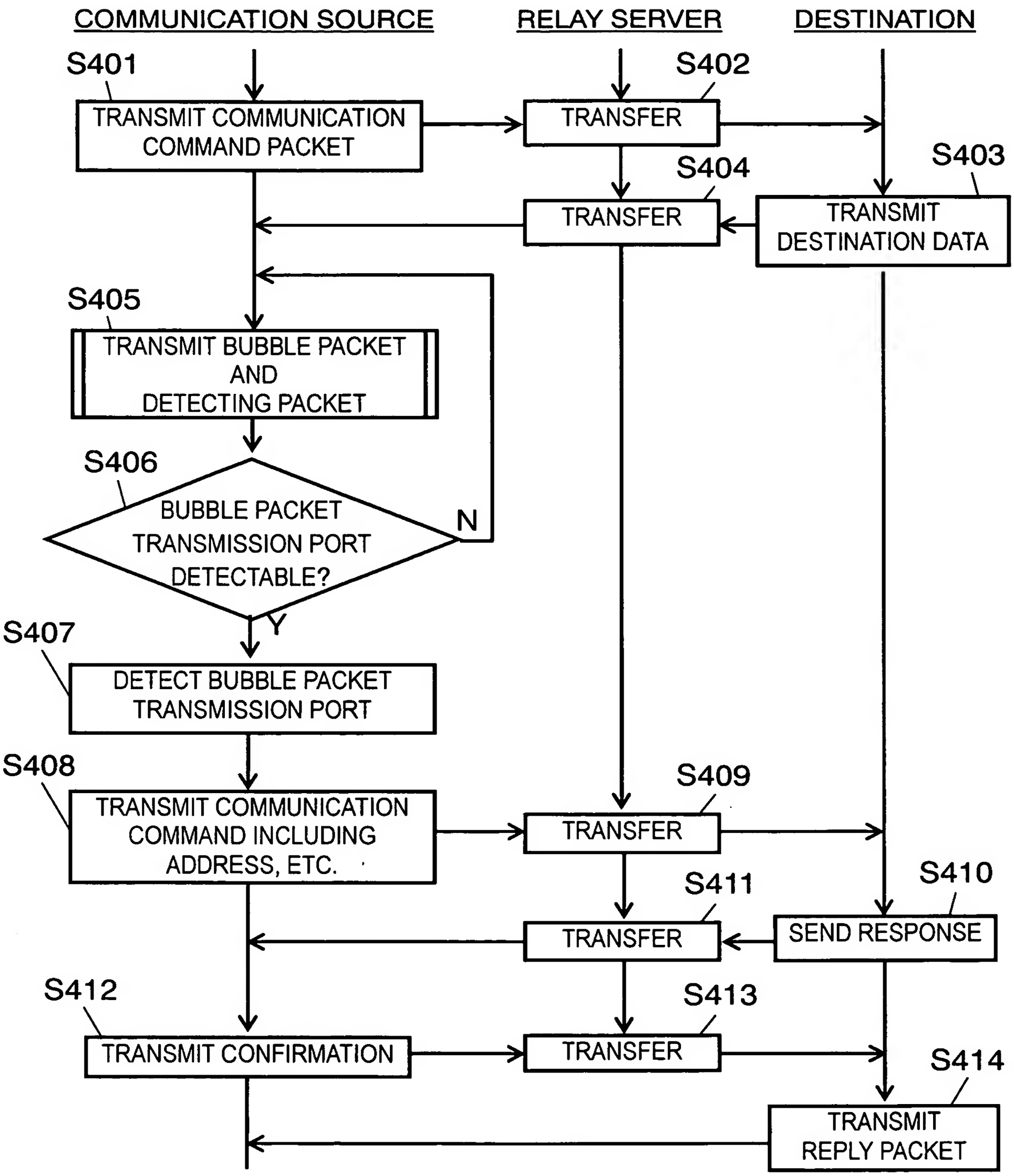

COMMUNICATION SOURCE
RELAY SERVER
DESTINATION
S401
TRANSMIT COMMUNICATION COMMAND PACKET
S402
TRANSFER
S403
TRANSMIT DESTINATION DATA
S404
TRANSFER
S405
TRANSMIT BUBBLE PACKET AND DETECTING PACKET
S406
BUBBLE PACKET TRANSMISSION PORT DETECTABLE?
N
Y
S407
DETECT BUBBLE PACKET TRANSMISSION PORT
S408
TRANSMIT COMMUNICATION COMMAND INCLUDING ADDRESS, ETC.
S409
TRANSFER
S410
SEND RESPONSE
S411
TRANSFER
S412
TRANSMIT CONFIRMATION
S413
TRANSFER
S414
TRANSMIT REPLY PACKET

FIG. 13

DEVICE ID	ADDRESS	PORT NO.
A001	202.224.135.10	12345
A002	202.132.10.6	23456
⋮	⋮	⋮

FIG. 14

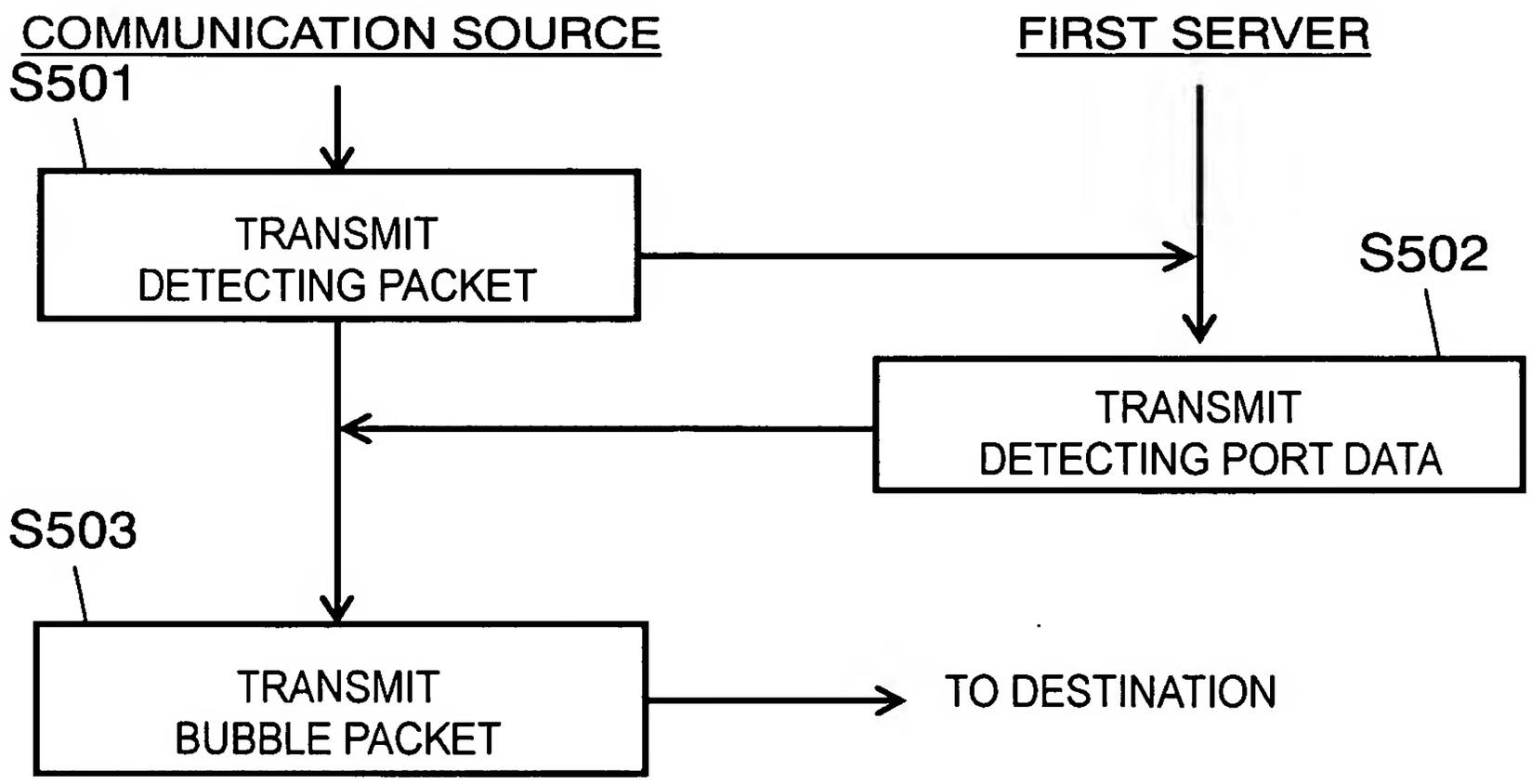


FIG. 15

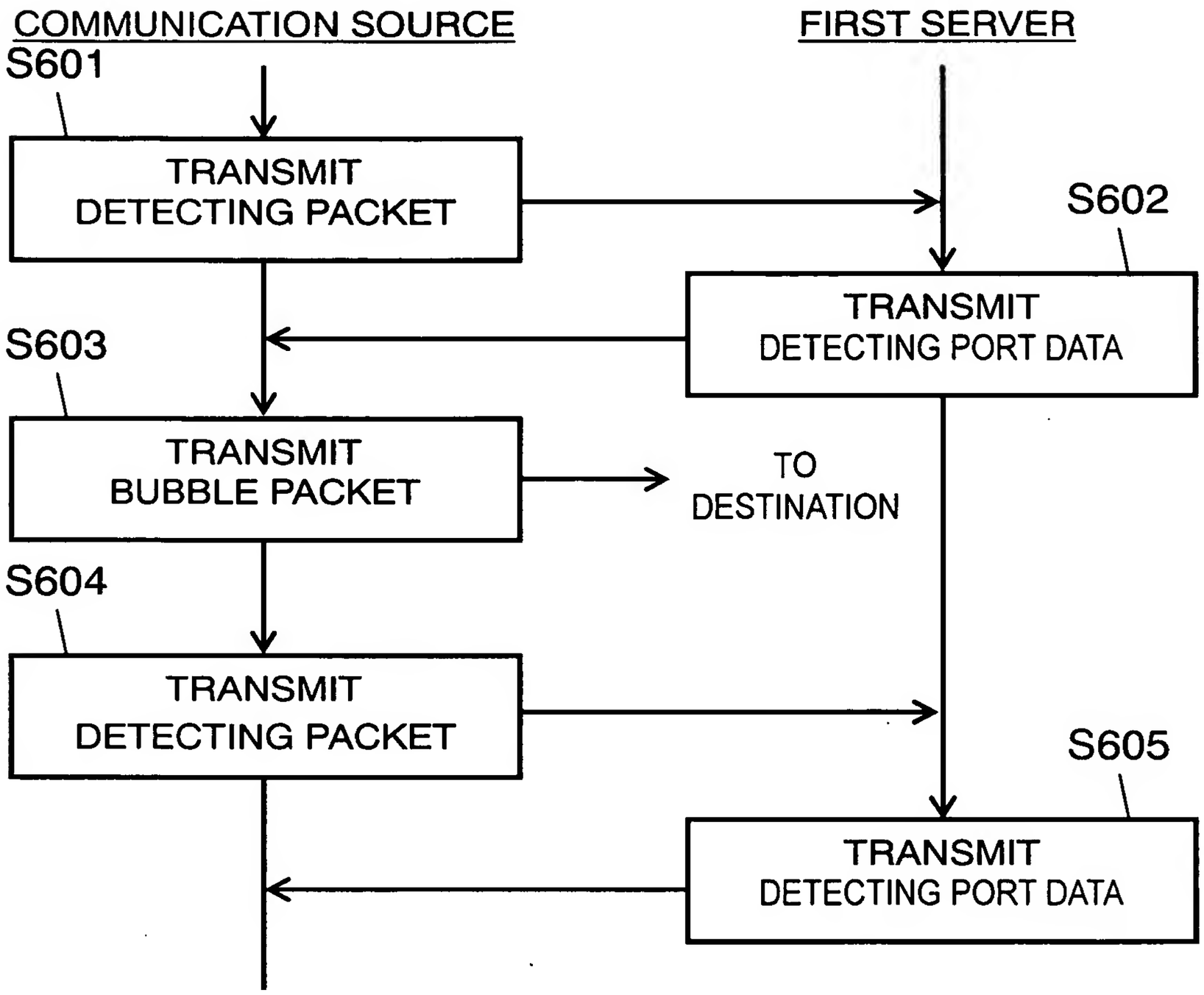

COMMUNICATION SOURCE
FIRST SERVER
S601
TRANSMIT DETECTING PACKET
S602
TRANSMIT DETECTING PORT DATA
S603
TRANSMIT BUBBLE PACKET
TO DESTINATION
S604
TRANSMIT DETECTING PACKET
S605
TRANSMIT DETECTING PORT DATA

FIG. 16

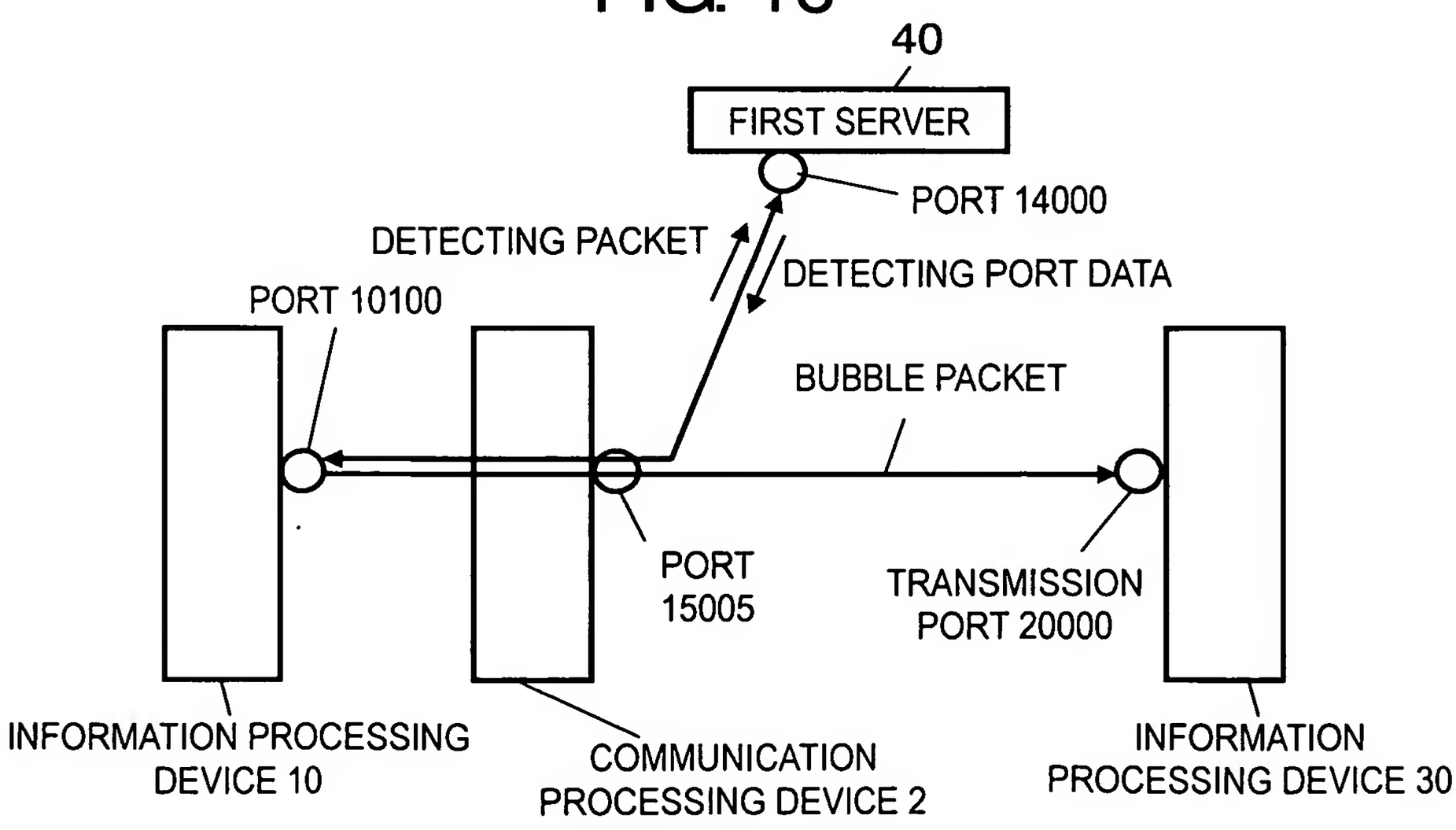

40
FIRST SERVER
PORT 14000
DETECTING PACKET
DETECTING PORT DATA
PORT 10100
BUBBLE PACKET
PORT 15005
TRANSMISSION PORT 20000
INFORMATION PROCESSING DEVICE 10
COMMUNICATION PROCESSING DEVICE 2
INFORMATION PROCESSING DEVICE 30

FIG. 17

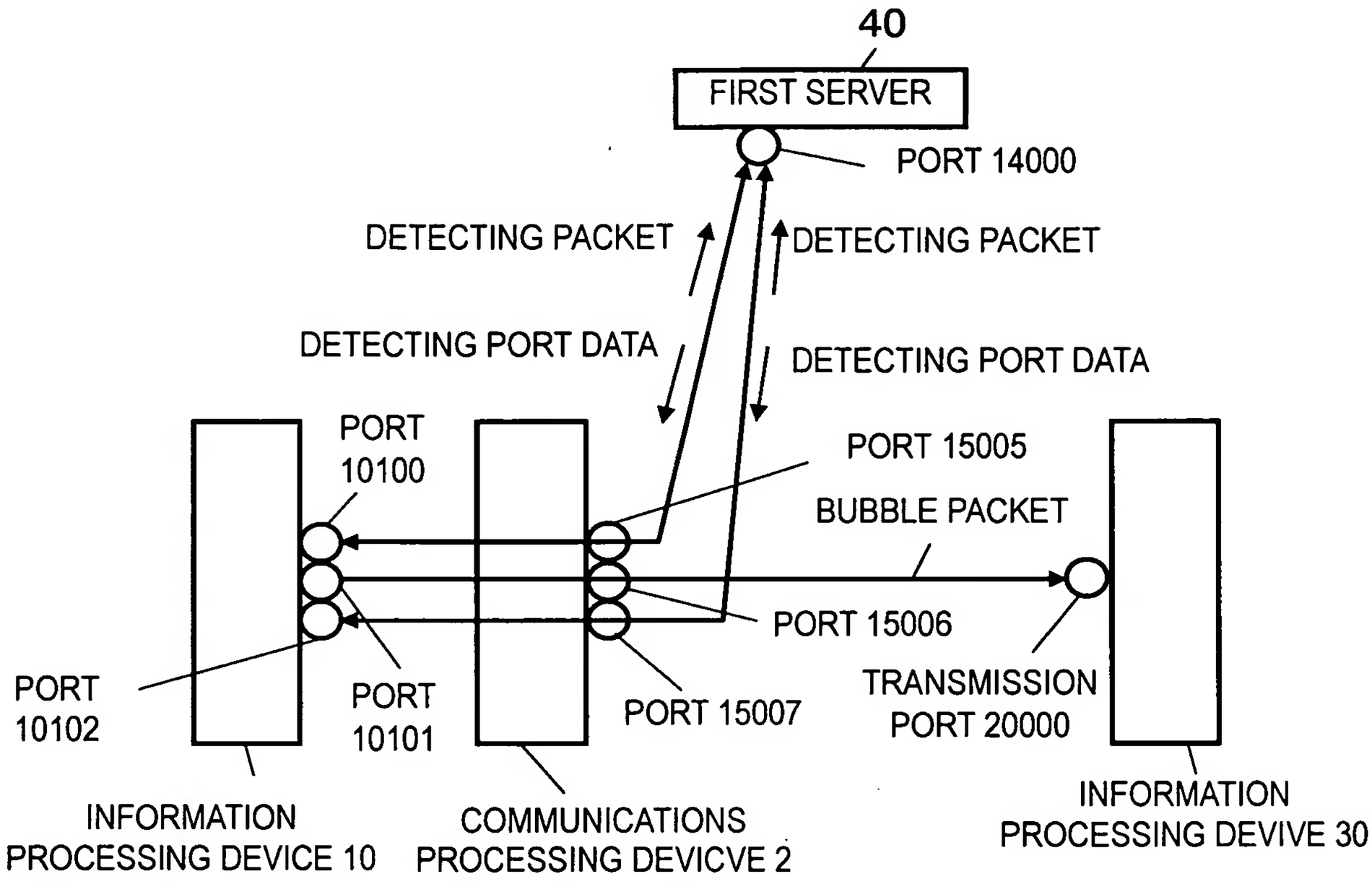

40
FIRST SERVER
PORT 14000
DETECTING PACKET
DETECTING PACKET
DETECTING PORT DATA
DETECTING PORT DATA
PORT 10100
PORT 15005
BUBBLE PACKET
PORT 15006
PORT 10102
PORT 10101
PORT 15007
TRANSMISSION PORT 20000
INFORMATION PROCESSING DEVICE 10
COMMUNICATIONS PROCESSING DEVICVE 2
INFORMATION PROCESSING DEVIVE 30

FIG. 18

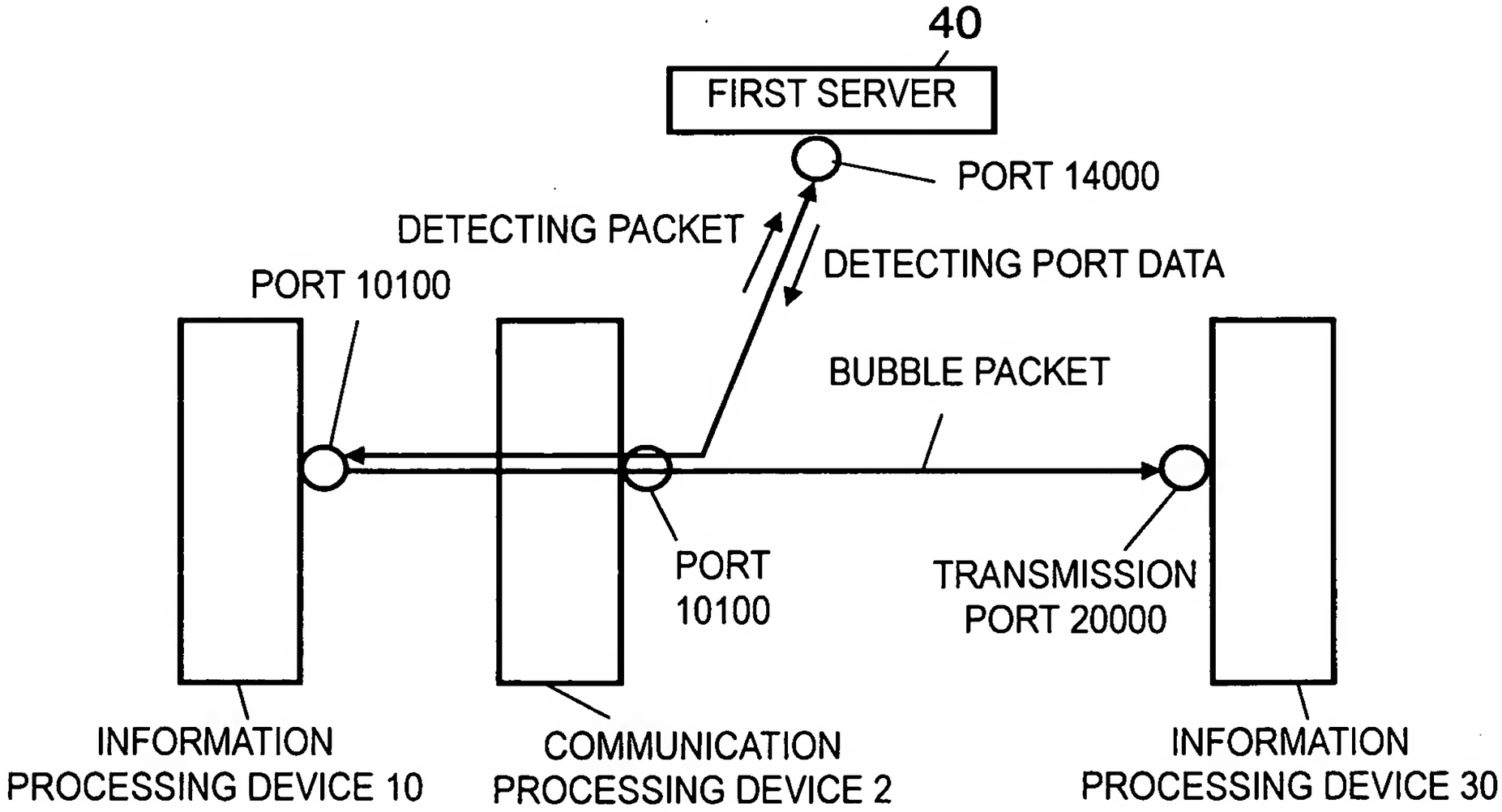

40
FIRST SERVER
PORT 14000
DETECTING PACKET
DETECTING PORT DATA
PORT 10100
BUBBLE PACKET
PORT 10100
TRANSMISSION PORT 20000
INFORMATION PROCESSING DEVICE 10
COMMUNICATION PROCESSING DEVICE 2
INFORMATION PROCESSING DEVICE 30

FIG. 19

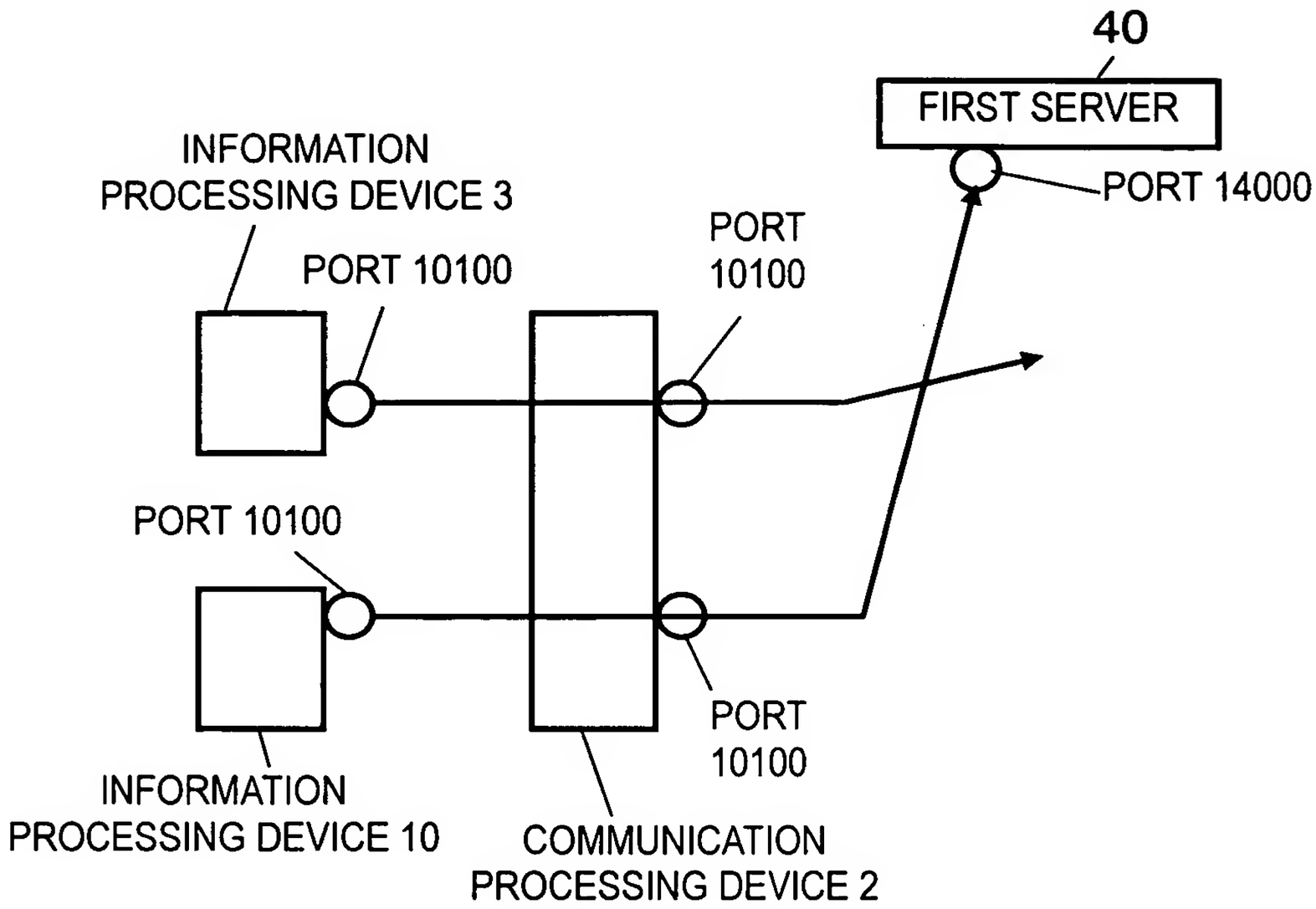

40
FIRST SERVER
PORT 14000
INFORMATION PROCESSING DEVICE 3
PORT 10100
PORT 10100
PORT 10100
PORT 10100
INFORMATION PROCESSING DEVICE 10
COMMUNICATION PROCESSING DEVICE 2

FIG. 20

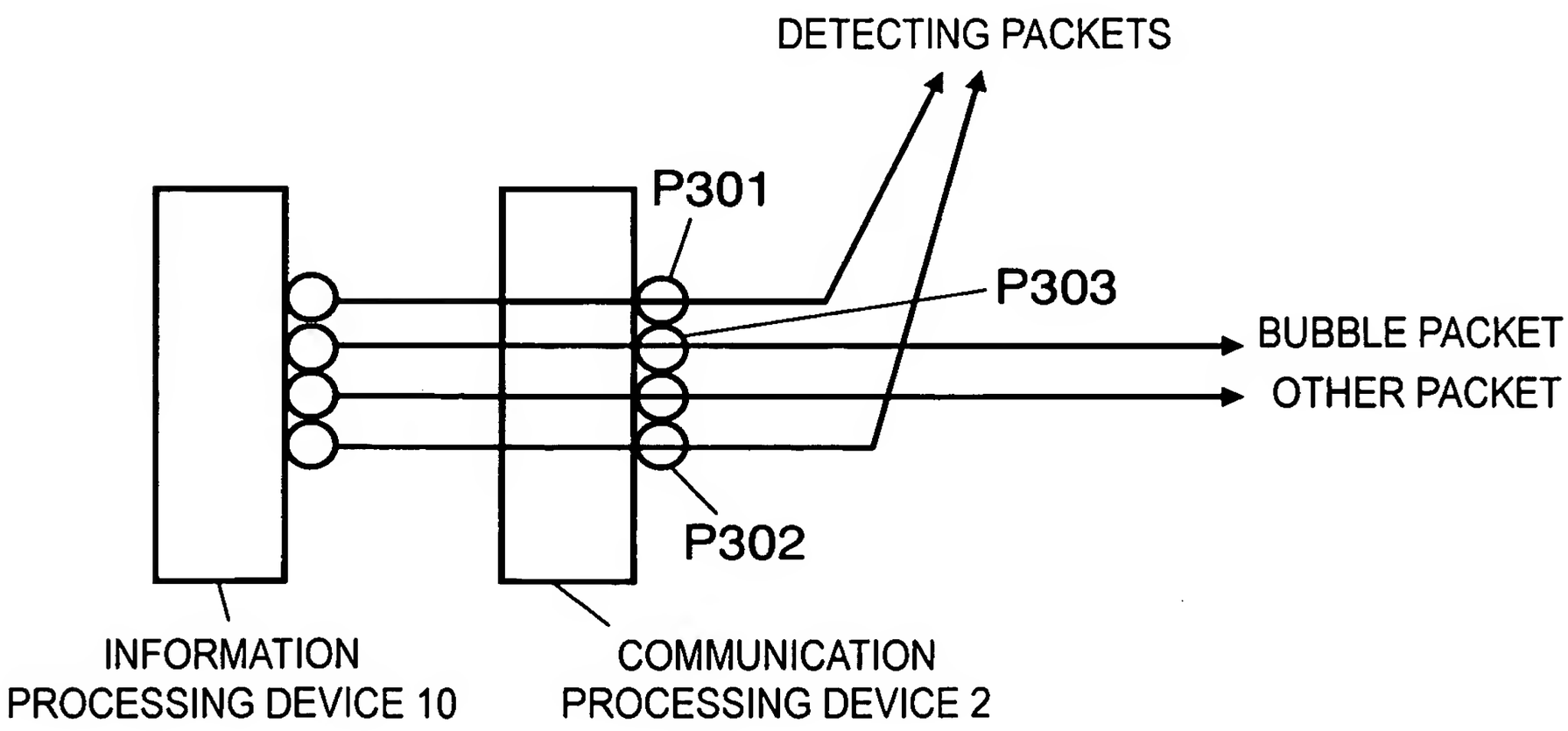

DETECTING PACKETS
P301
P303
BUBBLE PACKET
OTHER PACKET
P302
INFORMATION PROCESSING DEVICE 10
COMMUNICATION PROCESSING DEVICE 2

FIG. 21

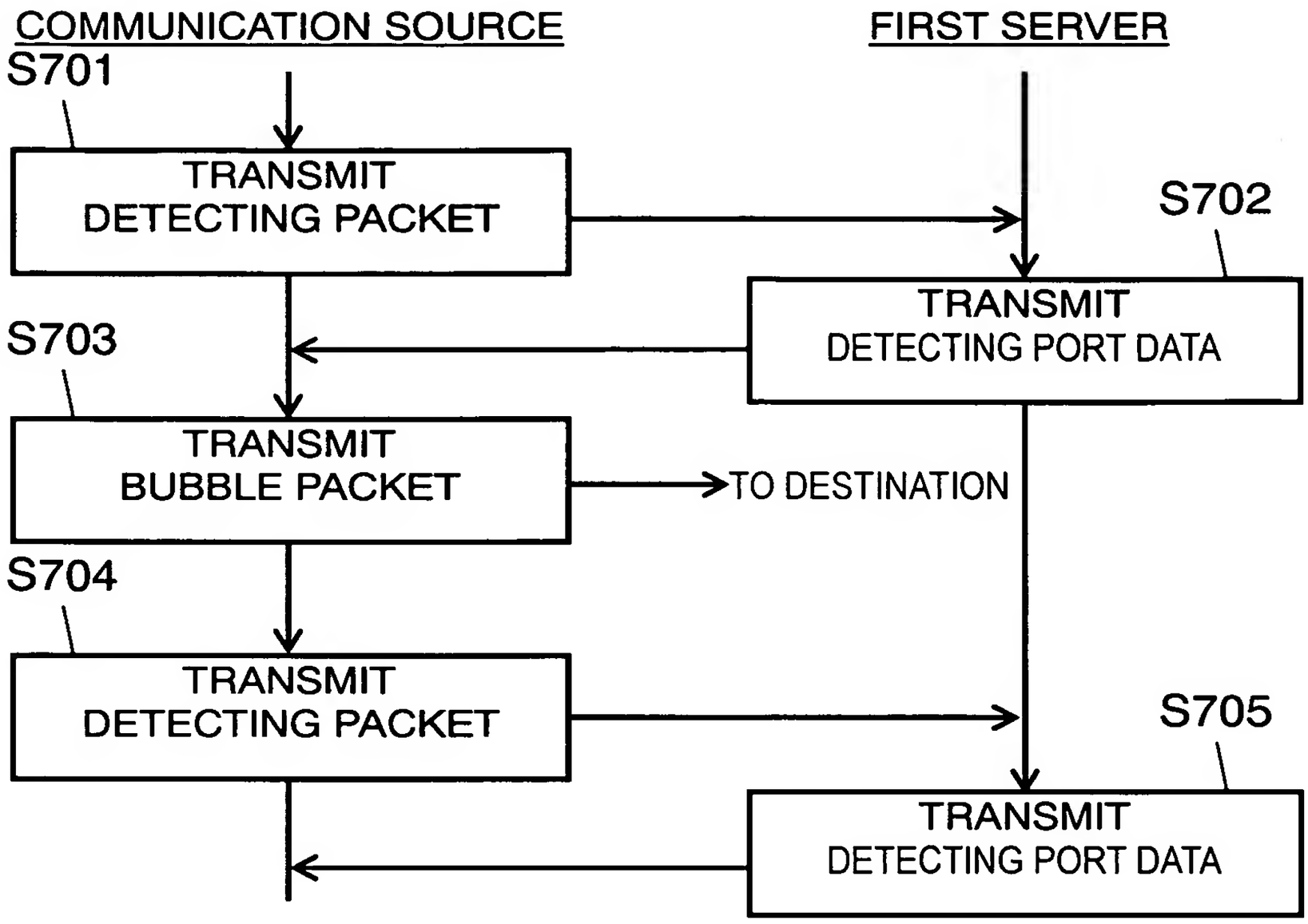

COMMUNICATION SOURCE
FIRST SERVER
S701
TRANSMIT DETECTING PACKET
S702
TRANSMIT DETECTING PORT DATA
S703
TRANSMIT BUBBLE PACKET
TO DESTINATION
S704
TRANSMIT DETECTING PACKET
S705
TRANSMIT DETECTING PORT DATA

FIG. 22

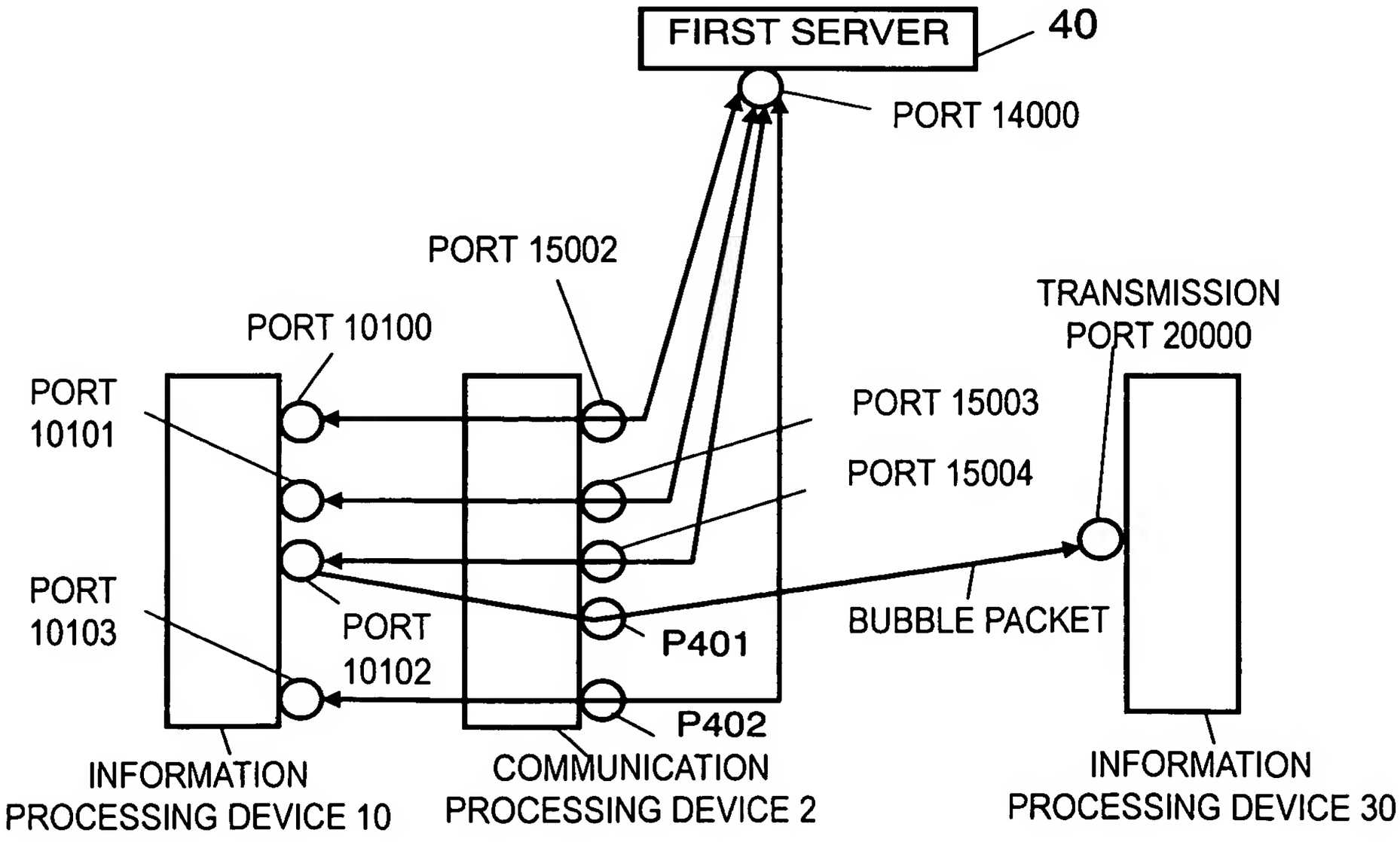

FIRST SERVER
40
PORT 14000
PORT 15002
PORT 10100
TRANSMISSION PORT 20000
PORT 10101
PORT 15003
PORT 15004
PORT 10103
PORT 10102
P401
BUBBLE PACKET
P402
INFORMATION PROCESSING DEVICE 10
COMMUNICATION PROCESSING DEVICE 2
INFORMATION PROCESSING DEVICE 30

FIG. 23

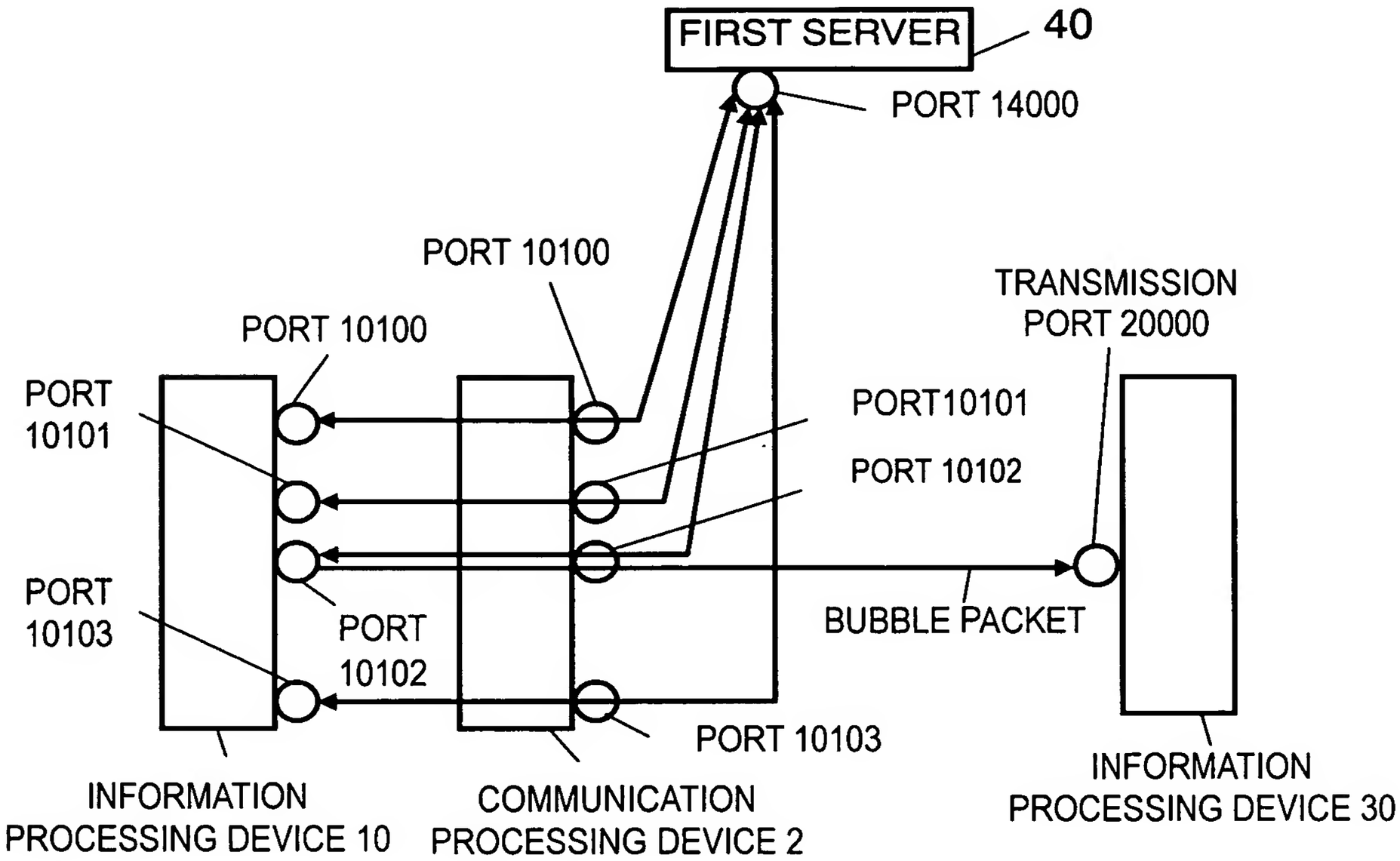

FIRST SERVER
40
PORT 14000
PORT 10100
PORT 10100
PORT 10101
PORT 10103
PORT 10102
PORT10101
PORT 10102
TRANSMISSION PORT 20000
BUBBLE PACKET
PORT 10103
INFORMATION PROCESSING DEVICE 10
COMMUNICATION PROCESSING DEVICE 2
INFORMATION PROCESSING DEVICE 30

FIG. 24

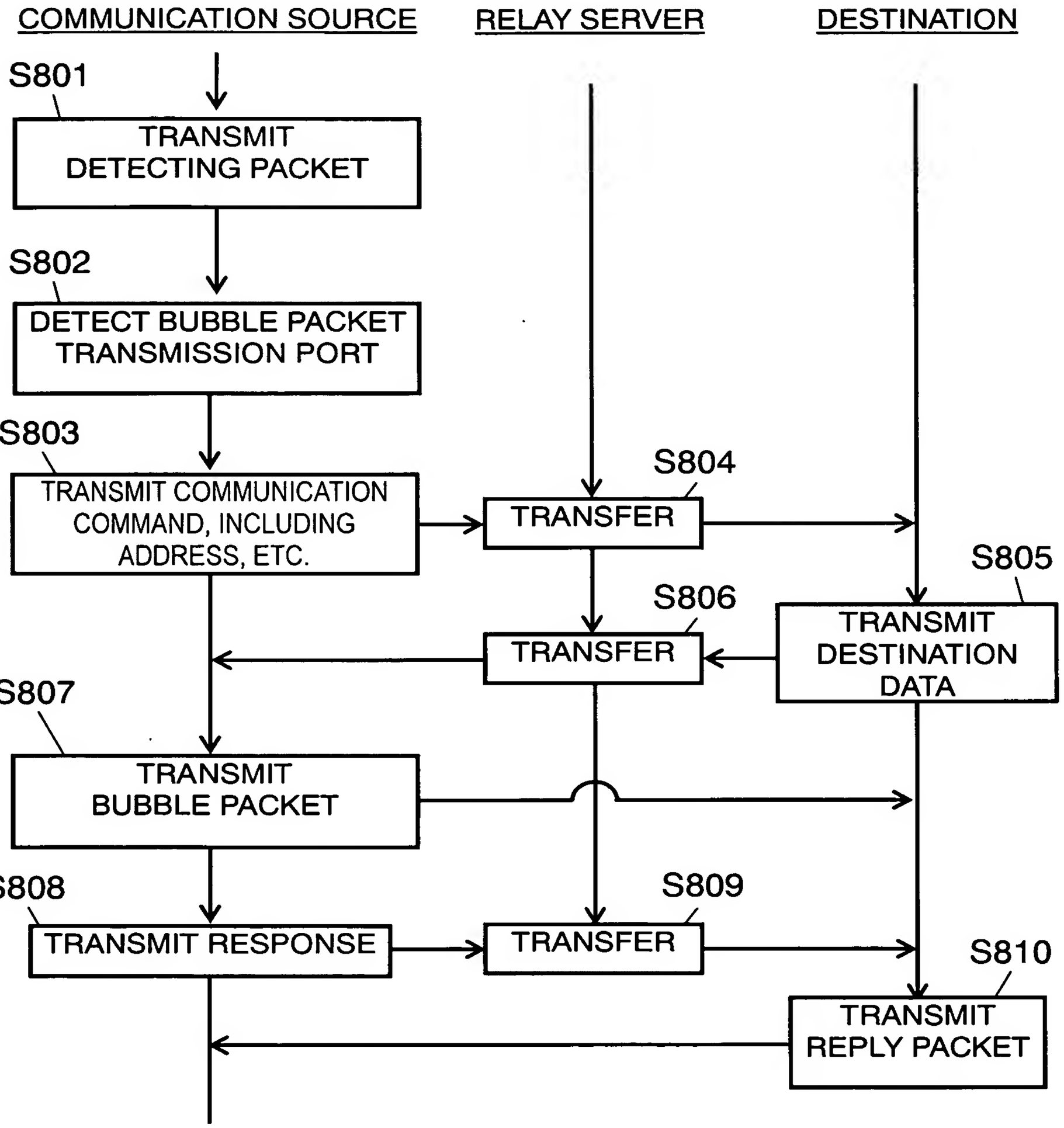
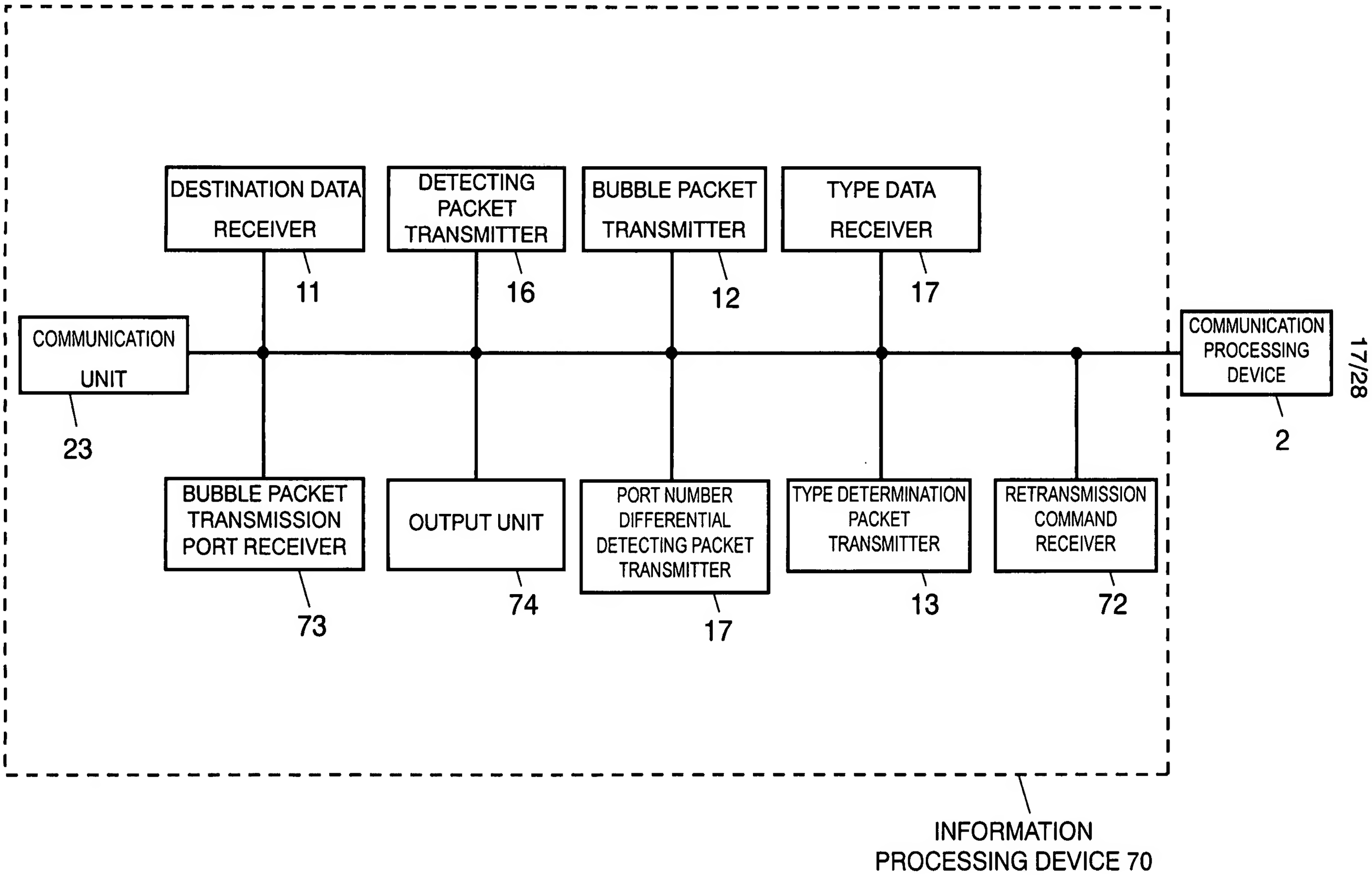

COMMUNICATION SOURCE
RELAY SERVER
DESTINATION
S801
TRANSMIT DETECTING PACKET
S802
DETECT BUBBLE PACKET TRANSMISSION PORT
S803
TRANSMIT COMMUNICATION COMMAND, INCLUDING ADDRESS, ETC.
S804
TRANSFER
S805
TRANSMIT DESTINATION DATA
S806
TRANSFER
S807
TRANSMIT BUBBLE PACKET
S808
TRANSMIT RESPONSE
S809
TRANSFER
S810
TRANSMIT REPLY PACKET

FIG. 25



Inventor: Kunio Gobara et al.
INFORMATION PROCESSING DEVICE, PORT ...
Atty. Docket No. MAT-8895US; Customer No. 52473

FIG. 26

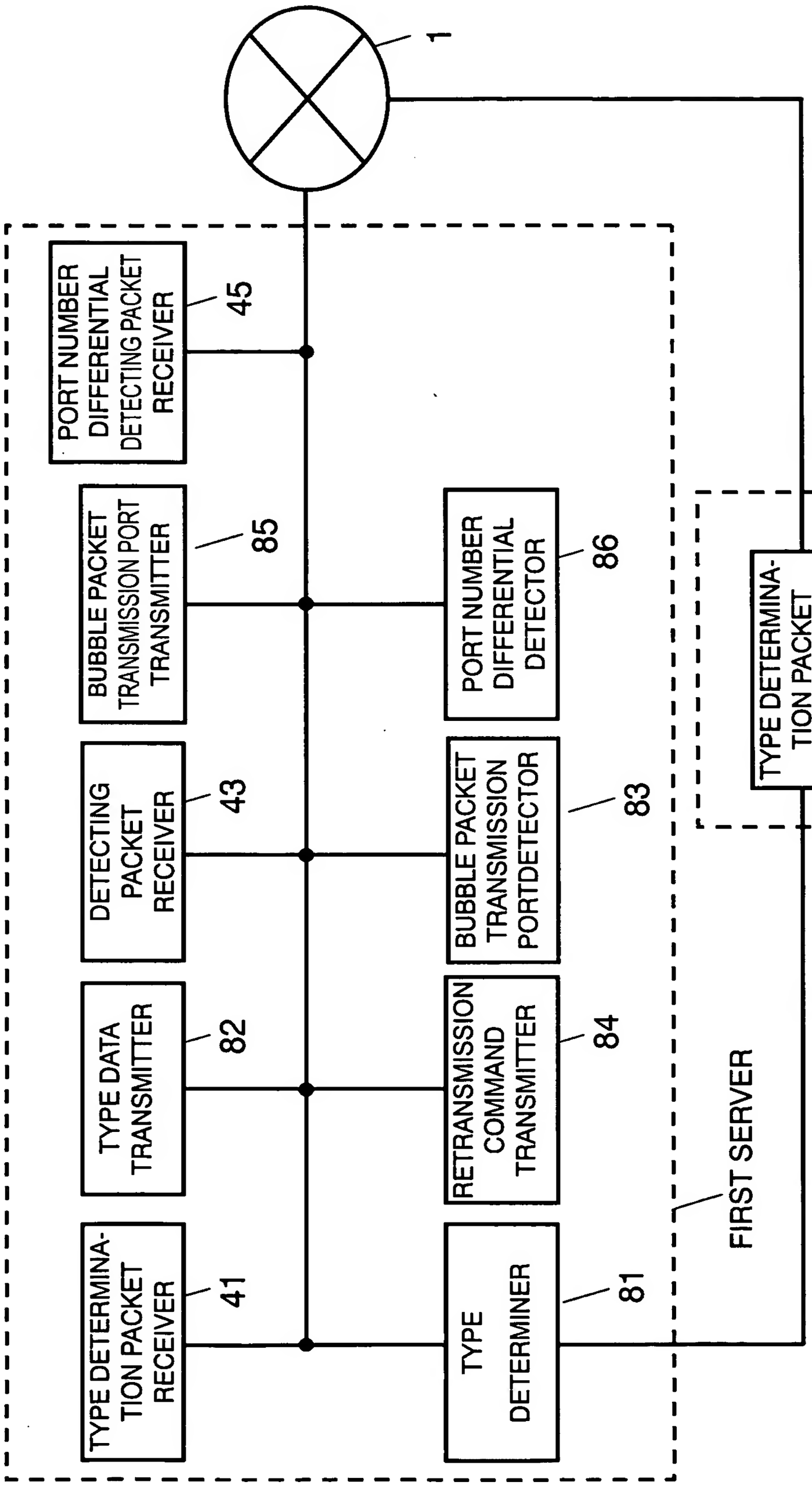

1
PORT NUMBER DIFFERENTIAL DETECTING PACKET RECEIVER
45
BUBBLE PACKET TRANSMISSION PORT TRANSMITTER
85
PORT NUMBER DIFFERENTIAL DETECTOR
86
DETECTING PACKET RECEIVER
43
BUBBLE PACKET TRANSMISSION PORTDETECTOR
83
TYPE DATA TRANSMITTER
82
RETRANSMISSION COMMAND TRANSMITTER
84
TYPE DETERMINATION PACKET RECEIVER
41
TYPE DETERMINER
81
TYPE DETERMINATION PACKET RECEIVER
51
SECOND SERVER
FIRST SERVER

FIG. 27

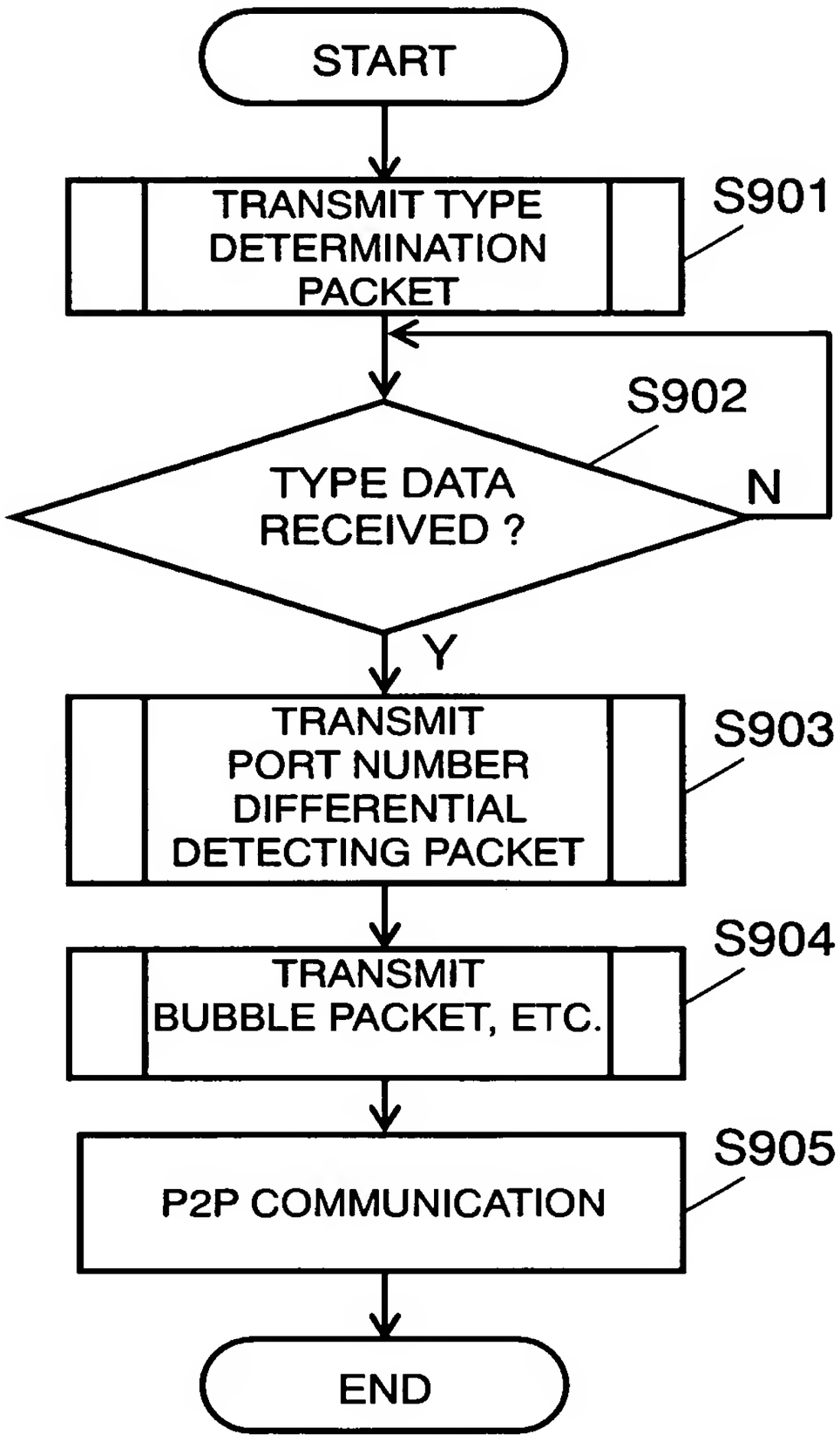

START
TRANSMIT TYPE DETERMINATION PACKET
S901
S902
TYPE DATA RECEIVED ?
N
Y
TRANSMIT PORT NUMBER DIFFERENTIAL DETECTING PACKET
S903
TRANSMIT BUBBLE PACKET, ETC.
S904
P2P COMMUNICATION
S905
END

FIG. 28

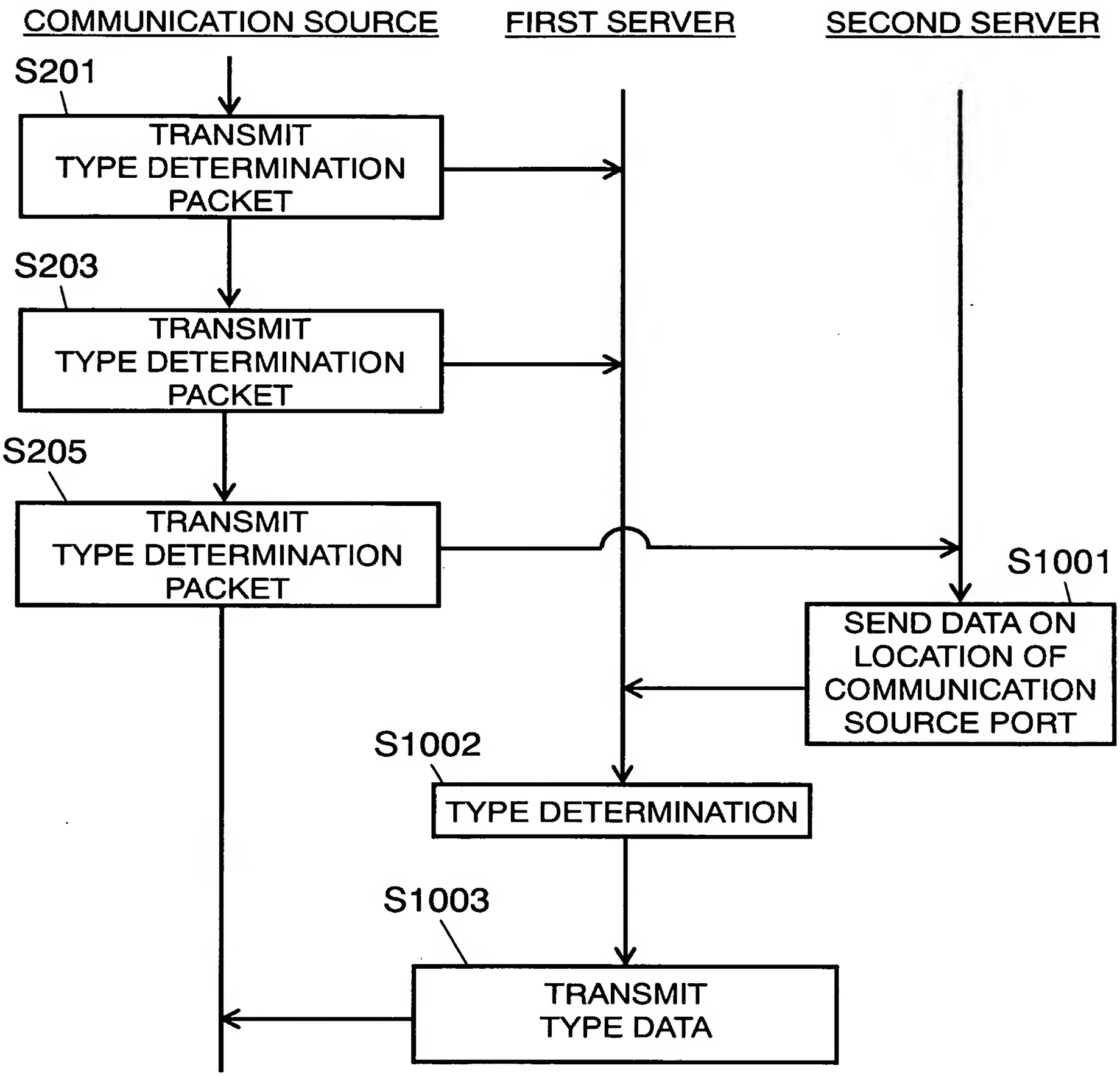

COMMUNICATION SOURCE
FIRST SERVER
SECOND SERVER
S201
TRANSMIT TYPE DETERMINATION PACKET
S203
TRANSMIT TYPE DETERMINATION PACKET
S205
TRANSMIT TYPE DETERMINATION PACKET
S1001
SEND DATA ON LOCATION OF COMMUNICATION SOURCE PORT
S1002
TYPE DETERMINATION
S1003
TRANSMIT TYPE DATA

FIG. 29

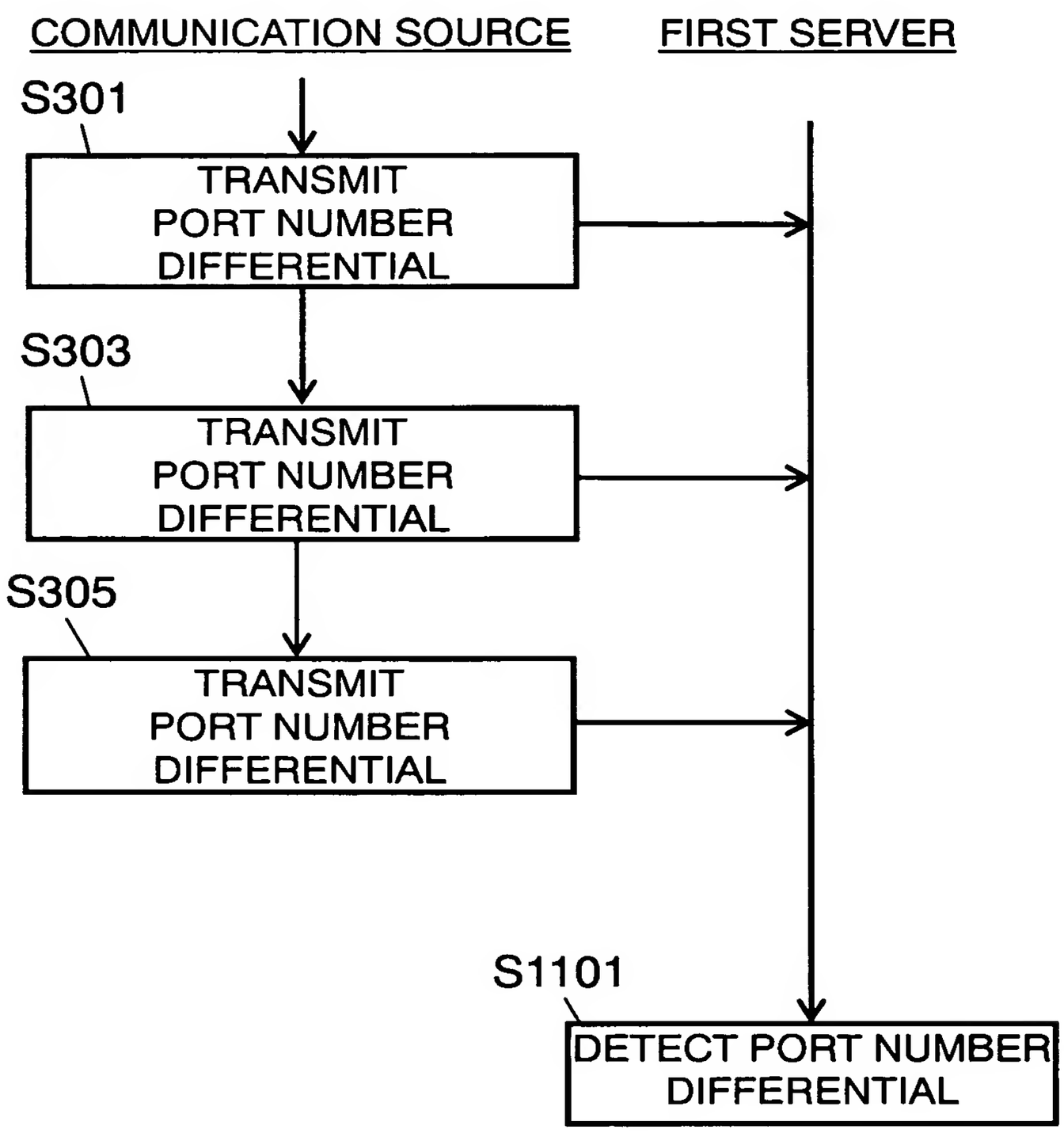

COMMUNICATION SOURCE
FIRST SERVER
S301
TRANSMIT PORT NUMBER DIFFERENTIAL
S303
TRANSMIT PORT NUMBER DIFFERENTIAL
S305
TRANSMIT PORT NUMBER DIFFERENTIAL
S1101
DETECT PORT NUMBER DIFFERENTIAL

FIG. 30

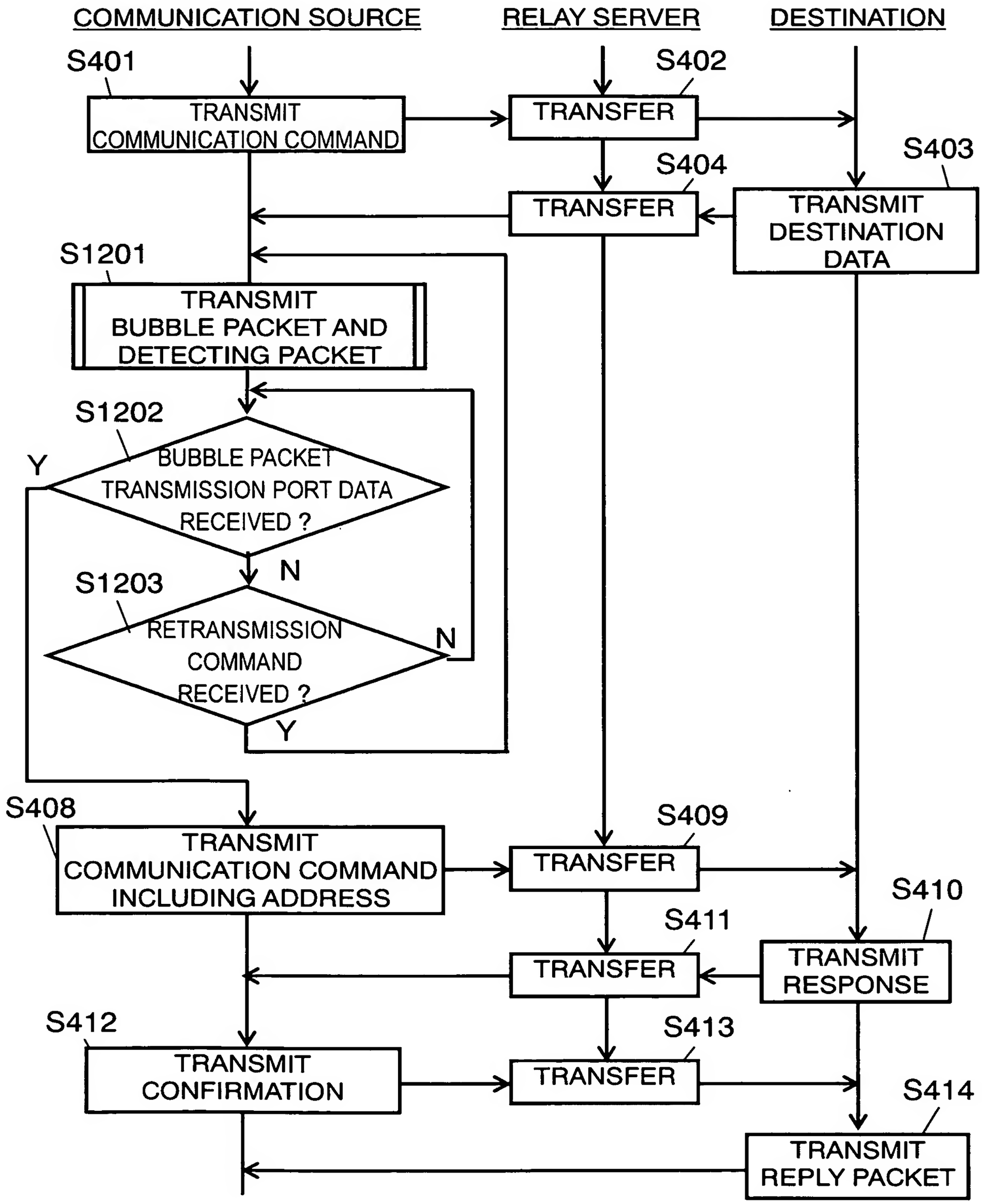

COMMUNICATION SOURCE
RELAY SERVER
DESTINATION
S401
TRANSMIT COMMUNICATION COMMAND
S402
TRANSFER
S403
TRANSMIT DESTINATION DATA
S404
TRANSFER
S1201
TRANSMIT BUBBLE PACKET AND DETECTING PACKET
S1202
BUBBLE PACKET TRANSMISSION PORT DATA RECEIVED ?
Y
N
S1203
RETRANSMISSION COMMAND RECEIVED ?
N
Y
S408
TRANSMIT COMMUNICATION COMMAND INCLUDING ADDRESS
S409
TRANSFER
S410
TRANSMIT RESPONSE
S411
TRANSFER
S412
TRANSMIT CONFIRMATION
S413
TRANSFER
S414
TRANSMIT REPLY PACKET

FIG. 31

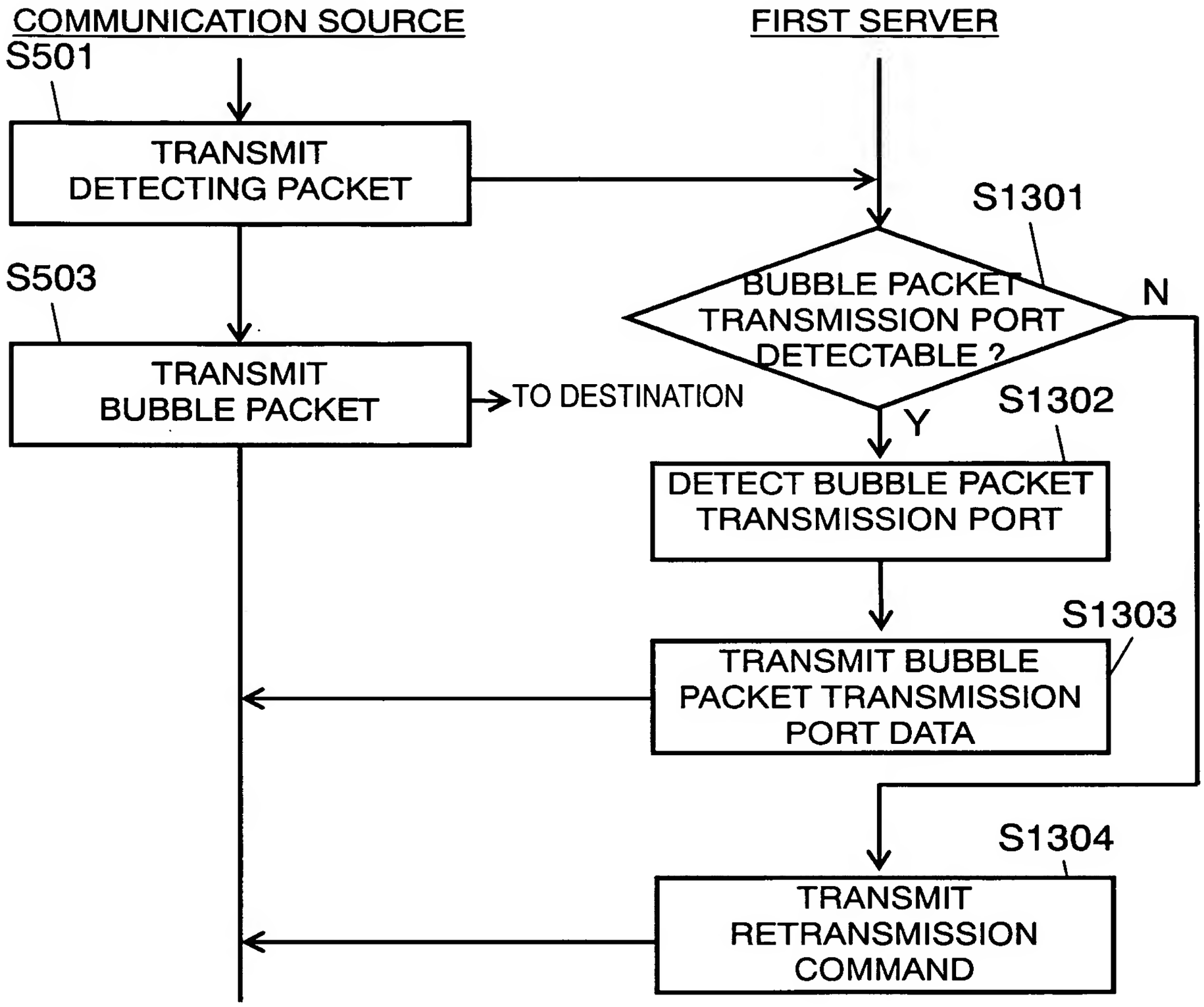

COMMUNICATION SOURCE
FIRST SERVER
S501
TRANSMIT DETECTING PACKET
S503
TRANSMIT BUBBLE PACKET
TO DESTINATION
S1301
BUBBLE PACKET TRANSMISSION PORT DETECTABLE ?
N
Y
S1302
DETECT BUBBLE PACKET TRANSMISSION PORT
S1303
TRANSMIT BUBBLE PACKET TRANSMISSION PORT DATA
S1304
TRANSMIT RETRANSMISSION COMMAND

FIG. 32

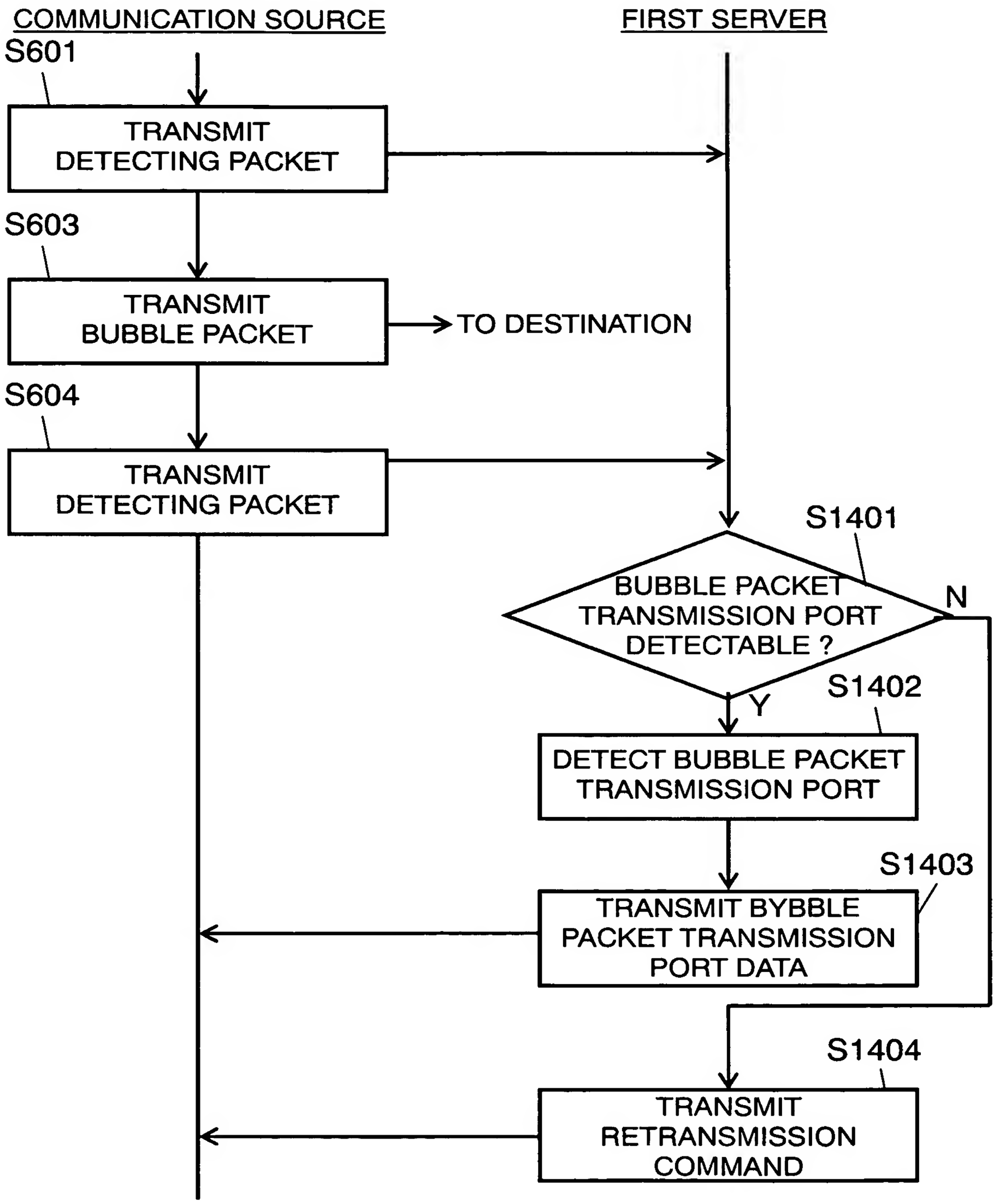

COMMUNICATION SOURCE
FIRST SERVER
S601
TRANSMIT DETECTING PACKET
S603
TRANSMIT BUBBLE PACKET
TO DESTINATION
S604
TRANSMIT DETECTING PACKET
S1401
BUBBLE PACKET TRANSMISSION PORT DETECTABLE ?
N
Y
S1402
DETECT BUBBLE PACKET TRANSMISSION PORT
S1403
TRANSMIT BYBBLE PACKET TRANSMISSION PORT DATA
S1404
TRANSMIT RETRANSMISSION COMMAND

FIG. 33

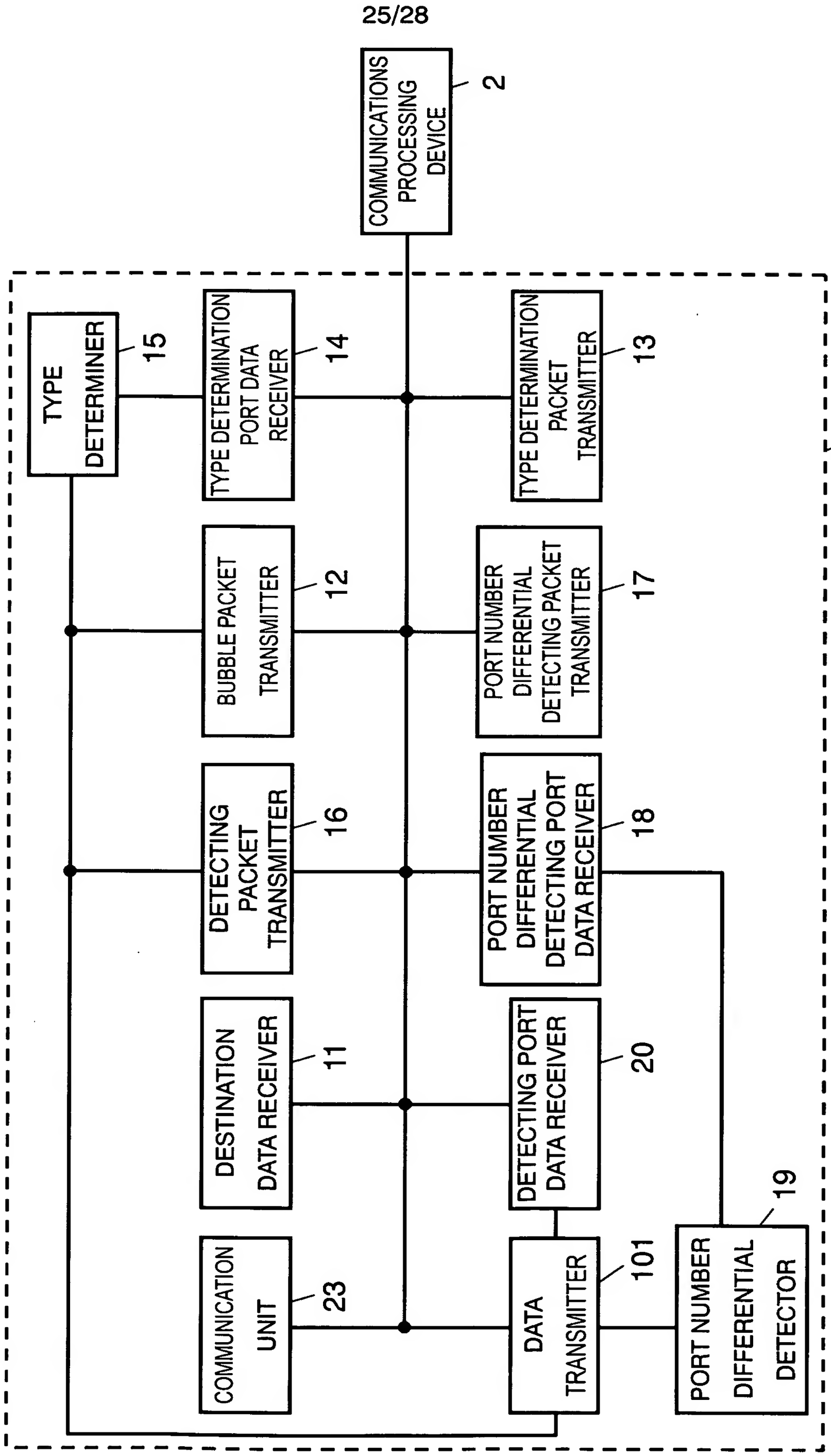

COMMUNICATIONS PROCESSING DEVICE
2
TYPE DETERMINER
15
TYPE DETERMINATION PORT DATA RECEIVER
14
TYPE DETERMINATION PACKET TRANSMITTER
13
INFORMATION PROCESSING DEVICE 100
BUBBLE PACKET TRANSMITTER
12
PORT NUMBER DIFFERENTIAL DETECTING PACKET TRANSMITTER
17
DETECTING PACKET TRANSMITTER
16
PORT NUMBER DIFFERENTIAL DETECTING PORT DATA RECEIVER
18
DESTINATION DATA RECEIVER
11
DETECTING PORT DATA RECEIVER
20
COMMUNICATION UNIT
23
DATA TRANSMITTER
101
PORT NUMBER DIFFERENTIAL DETECTOR
19

FIG. 34

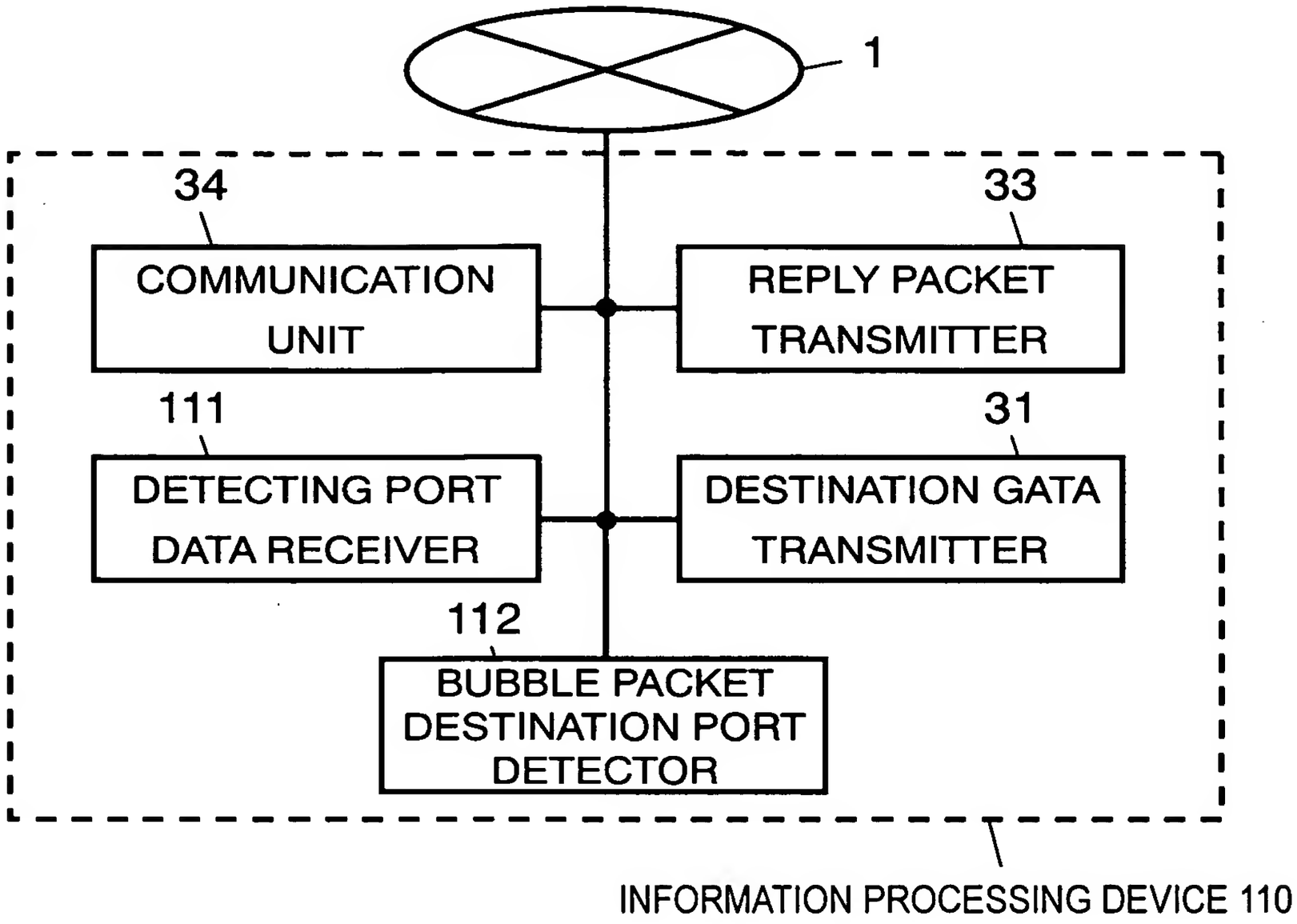

1
34
COMMUNICATION UNIT
33
REPLY PACKET TRANSMITTER
111
DETECTING PORT DATA RECEIVER
31
DESTINATION GATA TRANSMITTER
112
BUBBLE PACKET DESTINATION PORT DETECTOR
INFORMATION PROCESSING DEVICE 110

FIG. 35

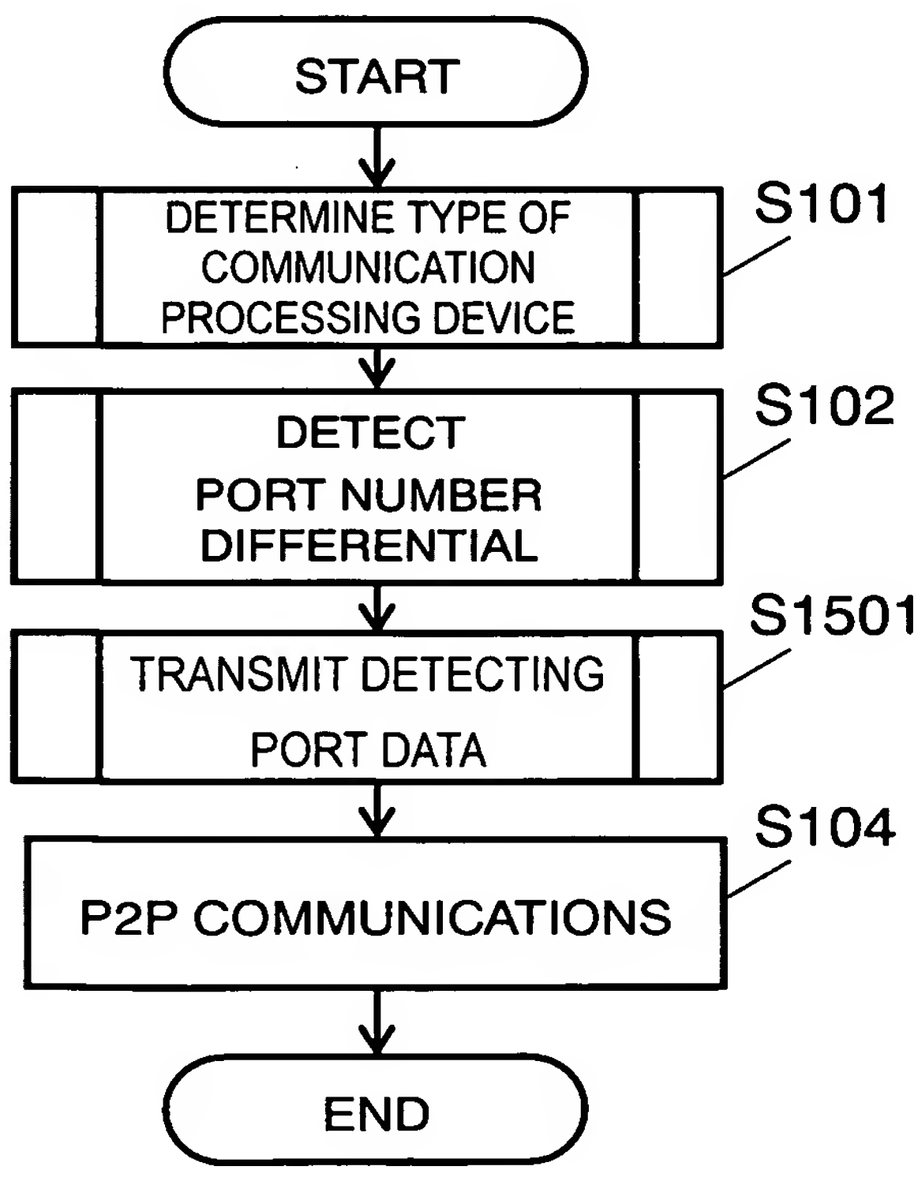

START
DETERMINE TYPE OF COMMUNICATION PROCESSING DEVICE
S101
DETECT PORT NUMBER DIFFERENTIAL
S102
TRANSMIT DETECTING PORT DATA
S1501
P2P COMMUNICATIONS
S104
END

FIG. 36

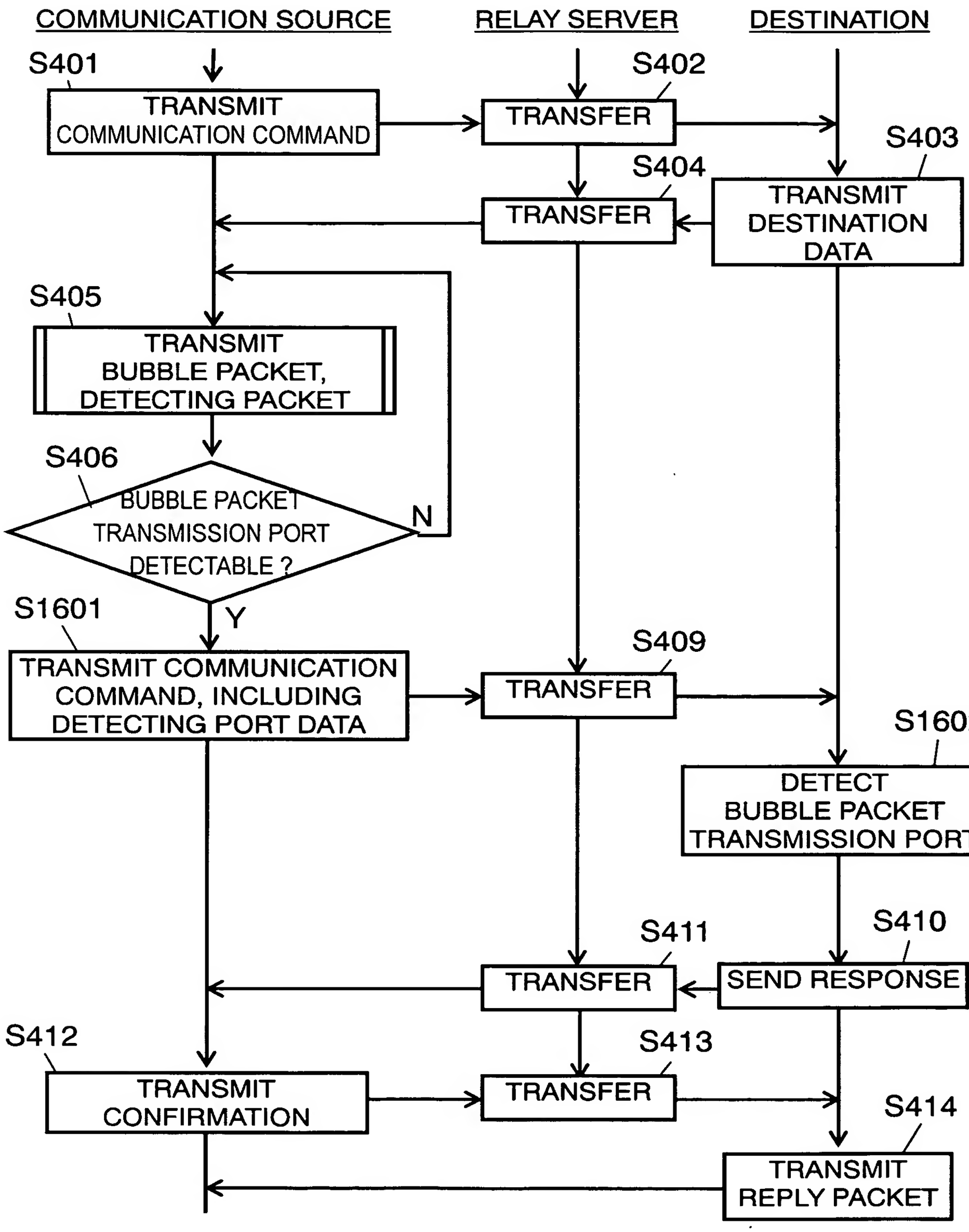

COMMUNICATION SOURCE
RELAY SERVER
DESTINATION
S401
TRANSMIT COMMUNICATION COMMAND
S402
TRANSFER
S403
TRANSMIT DESTINATION DATA
S404
TRANSFER
S405
TRANSMIT BUBBLE PACKET, DETECTING PACKET
S406
BUBBLE PACKET TRANSMISSION PORT DETECTABLE ?
N
Y
S1601
TRANSMIT COMMUNICATION COMMAND, INCLUDING DETECTING PORT DATA
S409
TRANSFER
S1602
DETECT BUBBLE PACKET TRANSMISSION PORT
S410
SEND RESPONSE
S411
TRANSFER
S412
TRANSMIT CONFIRMATION
S413
TRANSFER
S414
TRANSMIT REPLY PACKET

FIG. 37

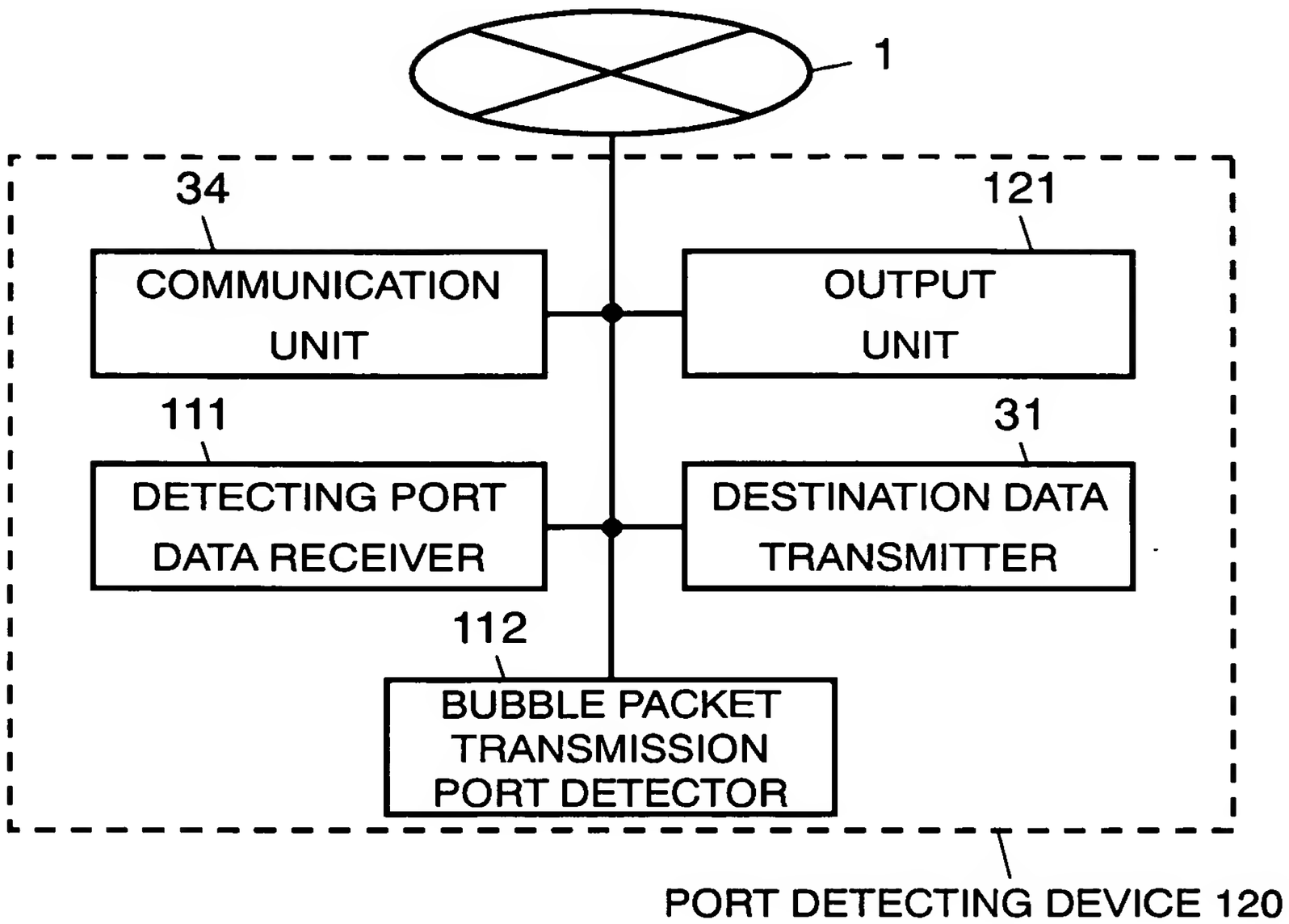
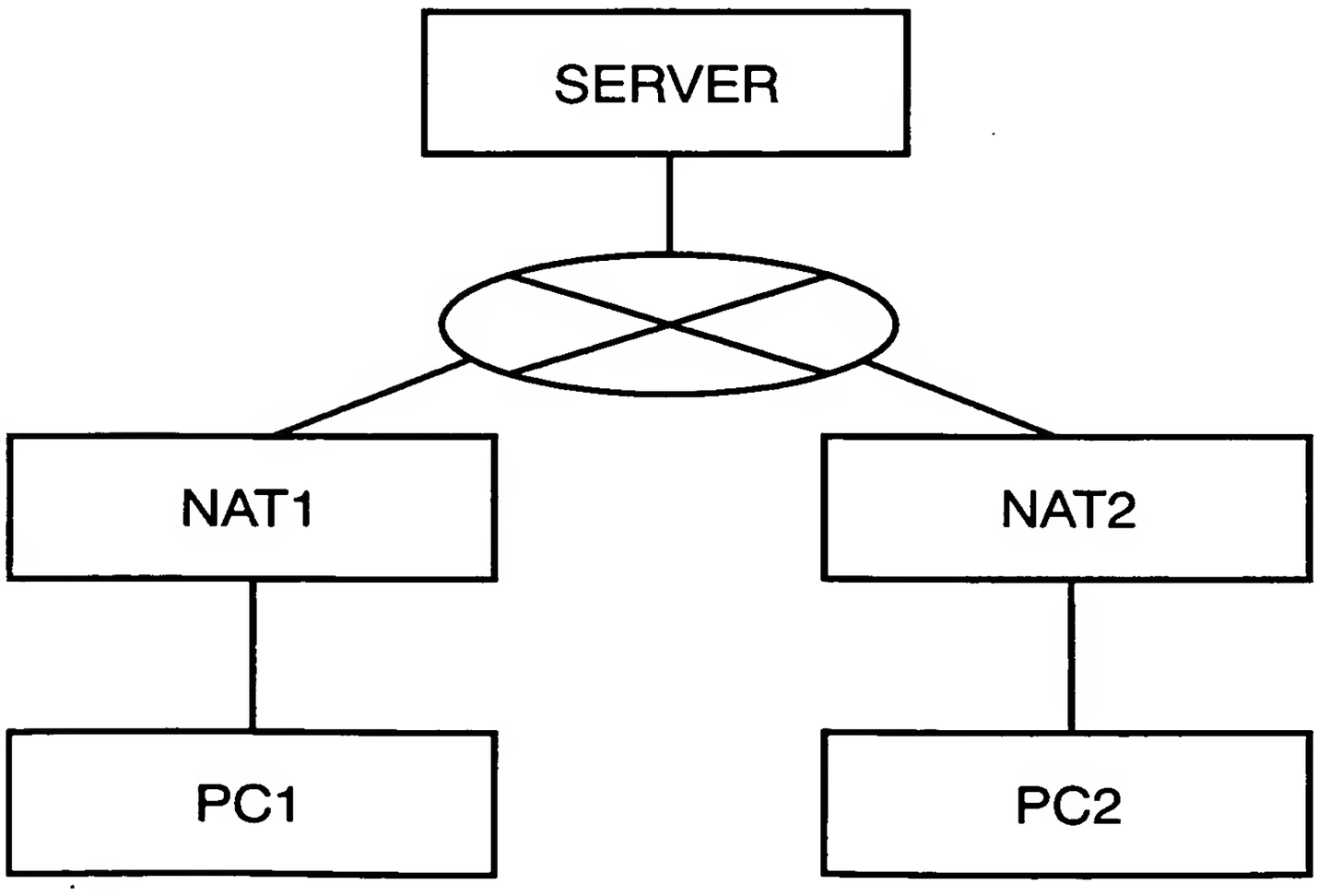

1
34
COMMUNICATION UNIT
121
OUTPUT UNIT
111
DETECTING PORT DATA RECEIVER
31
DESTINATION DATA TRANSMITTER
112
BUBBLE PACKET TRANSMISSION PORT DETECTOR
PORT DETECTING DEVICE 120

FIG. 38


SERVER
NAT1
NAT2
PC1
PC2